SPX®
WHERE IDEAS MEET INDUSTRY

INSTRUCTION MANUAL

CombiPrime H

Horizontal self-priming centrifugal pump

CH/EN (1111) 5.3

Orginal instructions
Read and understand this manual prior to operating or servicing this product.

Johnson Pump®

EC Declaration of conformity

(Directive 2006/42/EC, appendix II-A)

Manufacturer

SPX Flow Technology Assen B.V.
Dr. A.F. Philipsweg 51
9403 AD Assen
The Netherlands

hereby declares that all pumps member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiDirt, CombiFlex(U)(B), CombiPrime H, CombiLine, CombiLineBloc, CombiMag, CombiMagBloc, CombiNorm, CombiPro(M)(V), CombiPrime V, CombiSump, CombiWell, FRE, FRES, FREF, FREM, KGE(L), KGEF, HCR, MCH(W)(S), MCHZ(W)(S), MCV(S), PHA, MDR whether delivered without drive (last position of serial number = B), or delivered as an assembly with drive (last position of serial number = A), are in conformity with the provisions of Directive 2006/42/EC (as altered most recently) and where applicable the following directives and standards:

- EC directive 2006/95/EG, "Electric equipment for use within certain voltage limits"
- standards EN-ISO 12100 part 1 & 2, EN 809

The pumps to which this declaration refers may only be put into operation after they have been installed in the way prescribed by the manufacturer, and, as the case may be, after the complete system of which these pumps form part, has been made to fulfil the requirements of Directive 2006/42/EC (as altered most recently).

Declaration of incorporation

(Directive 2006/42/EC, appendix II-B)

Manufacturer

SPX Flow Technology Assen B.V.
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The Netherlands

hereby declares that the partly completed pump (Back-Pull-Out unit), member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiDirt, CombiFlex(U)(B), CombiPrime H, CombiLine, CombiLineBloc, CombiMag, CombiMagBloc, CombiNorm, CombiPro(M)(V), CombiPrime V, FRE, FRES, FREF, FREM, KGE(L), KGEF, HCR, PHA, MDR is in conformity with the following standards:

- EN-ISO 12100 parts 1 & 2, EN 809

and that this partly completed pump is meant to be incorporated into the specified pump unit and may only be put into use after the complete machine of which the pump under consideration forms part has been made and declared to comply with that directive.

Assen, January 1st 2011

G.A. Schaafsma,

General Manager

Instruction manual

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SPX is a Fortune 500, global multi-industry manufacturing leader. SPX divides its business into four segments and one of these is the SPX Flow Technology segment. SPX Flow Technology Assen B.V. is part of SPX Flow Technology segment.

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1 Introduction

1.1 Preface

This manual is intended for technicians and maintenance staff and for those who are in charge of ordering spare parts.

This manual contains important and useful information for the proper operation and maintenance of this pump. It also contains important instructions to prevent potential accidents and damage, and to ensure safe and fault-free operation of this pump.

! **Read this manual carefully before commissioning the pump, familiarize yourself with the operation of the pump and strictly obey the instructions!**

The data published here comply with the most recent information at the time of going to press. However they may be subject to later modifications.

SPX reserves the right to change the construction and design of the products at any time without being obliged to change earlier deliveries accordingly.

1.2 Safety

This manual contains instructions for working safely with the pump. Operators and maintenance staff must be familiar with these instructions.

Below is a list of the symbols used for those instructions and their meaning:

⚠ ***Personal danger for the user. Strict and prompt observance of the corresponding instruction is imperative!***

! **Risk of damage or poor operation of the pump. Follow the corresponding instruction to avoid this risk.**

➢ *Useful instruction or tip for the user.*

Items which require extra attention are shown in **bold print**.

This manual has been compiled by SPX with the utmost care. Nevertheless SPX cannot guarantee the completeness of this information and therefore assumes no liability for possible deficiencies in this manual. The buyer/user shall at all times be responsible for testing the information and for taking any additional and/or deviating safety measures. SPX reserves the right to change safety instructions.

1.3 Guarantee

SPX shall not be bound to any guarantee other than the guarantee accepted by SPX. In particular, SPX will not assume any liability for explicit and/or implicit guarantees such as but not limited to the marketability and/or suitability of the products supplied.

The guarantee will be cancelled immediately and legally if:

- Service and/or maintenance is not undertaken in strict accordance with the instructions.
- The pump is not installed and operated in accordance with the instructions.
- Necessary repairs are not undertaken by our personnel or are undertaken without our prior written permission.
- Modifications are made to the products supplied without our prior written permission.
- The spare parts used are not original SPX parts.
- Additives or lubricants used are other than those prescribed.
- The products supplied are not used in accordance with their nature and/or purpose.
- The products supplied have been used amateurishly, carelessly, improperly and/or negligently.
- The products supplied become defective due to external circumstances beyond our control.

All parts which are liable to wear are excluded from guarantee. Furthermore, all deliveries are subject to our "General conditions of delivery and payment", which will be forwarded to you free of charge on request.

1.4 Inspection of delivered items

Check the consignment immediately on arrival for damage and conformity with the advice note. In case of damage and/or missing parts, have a report drawn up by the carrier at once.

1.5 Instructions for transport and storage

1.5.1 Dimensions and weight

A pump or a pump unit is generally too heavy to be moved by hand. Therefore, use the correct transport and lifting equipment. Dimensions and weight of the pump or pump unit are shown on the label on the cover of this manual.

1.5.2 Use of pallets

Usually a pump or pump unit is shipped on a pallet. Leave it on the pallet as long as possible to avoid damages and to facilitate possible internal transport.

! When using a forklift always set the forks as far apart as possible and lift the package with both forks to prevent it from toppling over! Avoid jolting the pump when moving it!

1.5.3 Hoisting

When hoisting a pump or complete pump units the straps must be fixed in accordance with figure 1 and figure 2.

⚠ ***When lifting a pump or a complete pump unit always use a proper and sound lifting device, approved to bear the total weight of the load!***

⚠ ***Never go underneath a load that is being lifted!***

! **If the electric motor is provided with a lifting eye, this lifting eye is intended only for the purpose of carrying out service activities to the electric motor! The lifting eye is designed to bear the weight of the electric motor only! It is NOT permitted to lift a complete pump unit at the lifting eye of an electric motor!**

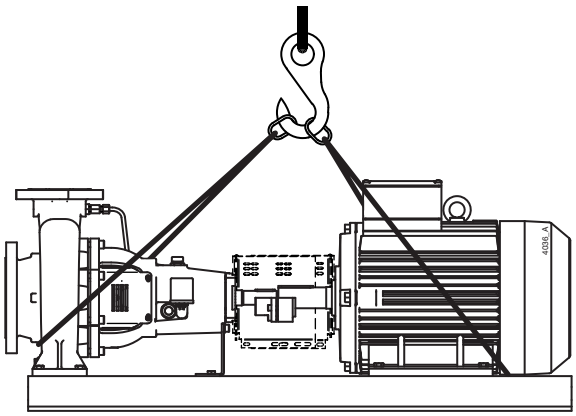


Figure 1: Lifting instructions for pump unit.

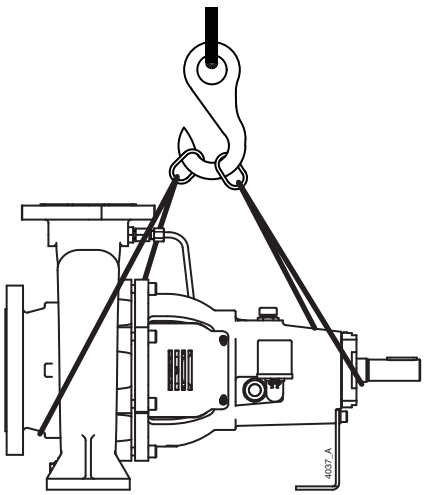


Figure 2: Lifting instructions for single pump.

1.5.4 Storage

If the pump is not to be used immediately the pump shaft must be turned by hand twice per week.

1.6 Ordering parts

This manual contains a survey of the spare parts recommended by SPX as well as the instructions for ordering them. A fax-order form is included in this manual.

You should always state all data stamped on the type plate when ordering parts and in any other correspondence regarding the pump.

➢ *This data is also printed on the label on the front of this manual.*

If you have any questions or require further information with regard to specific subjects, then do not hesitate to contact SPX.

2 General

2.1 Pump description

The CombiPrime H is a range of horizontal self-priming centrifugal pumps. Hydraulic application area complies with EN 733 (DIN 24255). Flange dimensions, bolt circle and number of holes comply with ISO 7005 PN10 (DIN 2532 ND10). The CombiPrime H is characterized by the built-in vacuum pump.

Thus it is possible to pump fluids mixed with air (gas) or only air during the suction phase. The built-in vacuum pump is based on the liquid ring principle. The pump is driven by a standard IEC foot motor. The power is transmitted through a flexible coupling.

Because of their modular lay-out, constructional components are widely interchangeable, also with other pump types of the Combi system.

2.2 Type code

Pumps are available in various designs. The main characteristics of the pump are shown in the type code.

Example: **CH 40-200 B2 M2 TL**

Pump family		
CH	**C**ombiPrime **H**	
Pump size		
40-200	diameter discharge connection [mm] - nominal impeller diameter [mm]	
Pump casing/pump cover and impeller material		
G1	pump casing/pump cover: cast iron	impeller: cast iron
G2	pump casing/pump cover: cast iron	impeller: bronze
G3	pump casing/pump cover: cast iron	impeller: alum. bronze
B2	pump casing/pump cover: bronze	impeller: bronze
B3	pump casing/pump cover: bronze	impeller: alum. bronze
Shaft sealing		
M2	mechanical seals on shaft sleeves	
M4	tab ring seals on shaft sleeves	
De-aerating unit		
TL	works liquid receiver + air inlet valve	
VL	float de-aerator + air inlet valve	

2.3 Serial number

Serial number of the pump or pump unit are shown on the name plate off the pump and on the label on the cover of this manual

Example: **01-1000675A**

01	year of manufacture
100067	unique number
5	number of pumps
A	pump with motor
B	pump with free shaft end

2.4 Application

- In general, this pump can be used for thin, clean or slightly polluted liquids. These liquids should not affect the pump materials.
- The maximum allowed system pressure and temperature and the maximum speed depend on the pump type and the pump construction. For relevant data see paragraph 2.6 "Application area".
- Further details about the application possibilities of your specific pump are mentioned in the order confirmation and/or in the data sheet enclosed with the delivery.
- Do not use the pump for purposes other than those for which it is delivered without prior consultation with your supplier.

⚠ ***Using a pump in a system or under system conditions (liquid, working pressure, temperature, etc.) for which it has not been designed may hazard the user!***

2.5 Construction

The pump has a modular design. The main components:

- Pump casing/impeller/pump shaft
- Shaft seal
- Self-priming unit
- Bearing

The CombiPrime H pumps are available in 3 bearing bracket groups, meaning that bearing and shaft sealing are divided into 3 groups. Furthermore, the pumps have been standardized in 5 groups featuring the same connection for pump cover and bearing pedestal, depending on the nominal impeller diameters. The pump covers are clamped between the pump casing and bearing bracket.

2.5.1 Pump casing/impeller/pump shaft

These are the parts that get into contact with the pumped liquid. For each individual pump type there is only one design of the pump casing and the impeller. The pump casing is available in cast iron and in bronze, the impeller is available in cast iron, bronze and aluminium bronze. The pump shaft is available in alloyed and stainless steel. With the available materials the pumps can be supplied in a construction suitable to pump sea water.

2.5.2 Shaft sealing

On both sides of the self-priming part there is a mechanical seal or a number of lip seals. Both are mounted on shaft sleeves, which have been sealed in such a way that the pumped liquid cannot touch the pump shaft. The mechanical seals meet EN 12756 (DIN 24960), with the exception of the mounting length. The lip seals are mounted on stainless steel shaft sleeves which have been provided with a hard chromium oxide wearing layer.

2.5.3 Self-priming part

The self-priming part consists of a built-in vacuum pump which is working according to the liquid ring principle, an air-inlet valve with a check valve and a service liquid tank or float controlled air-relief valve. The vacuum pump part is mounted on the pump shaft, but works separately from the centrifugal pump. The service liquid which is supplied to the hub section of the vacuum pump has to maintain the liquid ring. Apart from that, it also serves for cooling and lubrication of the vacuum pump and the shaft seals.

2.5.4 Bearing construction

The bearing construction consists of 2 angular contact ball bearings combined with a cylindrical bearing. The bearings are grease lubricated. The angular contact bearings are mounted in a adjusting sleeve, with which the entire pump shaft can be shifted in order to adjust the axial tolerance of the pump wheel.

2.6 Application area

The application area globally looks as follows:

Table 1: Application area.

	Maximum value
Capacity	500 m^3/h
Discharge head	100 m
System pressure	10 bar
Temperature	80°C

However, the maximum allowable pressures and temperatures depend strongly on the selected materials and components. Also working conditions may cause differences.

2.7 Re-use

The pump may only be used for other applications after prior consultation with SPX or your supplier. Since the lastly pumped medium is not always known, the following instructions should be observed:

- Flush the pump properly
- Make sure the flushing liquid is discharged safely (environment!)

⚠ ***Take adequate precautions and use the appropriate personal protection means (rubber gloves, spectacles)!***

2.8 Scrapping

If it has been decided to scrap a pump, the same procedure as for paragraph 2.7 "Re-use" should be followed.

3 Installation

3.1 Safety

- Read this manual carefully prior to installation and commissioning. Non-observance of these instructions can result in serious damage to the pump and this will not be covered under the terms of our guarantee. Follow the instructions given step by step.
- Ensure that the pump can not be started if work has to be undertaken to the pump during installation and the rotating parts are insufficiently guarded.
- Depending on the design the pumps are suitable for liquids with a temperature of up to 80°C. When installing the pump unit to work at 70°C and above the user should ensure that appropriate protection measures and warnings are fitted to prevent contact with the hot pump parts.
- If there is danger of static electricity, the entire pump unit must be earthed.
- If the pumped liquid is harmful to men or the environment, take appropriate measures to drain the pump safely. Possible leakage liquid from the shaft seal should also be discharged safely.

3.2 Preservation

In order to prevent corrosion, the inside of the pump is treated with a preserving agent before leaving the factory.

Before commissioning the pump remove any preserving agents and flush the pump thoroughly with hot water.

3.3 Environment

- The foundation must be hard, level and flat.
- The area in which the pump is installed must be sufficiently ventilated. An ambient temperature or air humidity which is too high, or a dusty environment, can have a detrimental effect on the operation of the electric motor.
- There should be sufficient space around the pump unit to operate and if necessary repair it.
- Behind the cooling air inlet of the motor there must be a free area of at least ¼ of the electric motor diameter, to ensure unobstructed air supply.

3.4 Mounting

3.4.1 Installation of a pump unit

Pump and motor shafts of complete pump units are adjusted perfectly in line in the works.

1 In case of permanent arrangement place the base plate level on the foundation with the aid of shims.

2 Carefully tighten the nuts on the foundation bolts.

3 Check the alignment of pump and motor shafts and if necessary realign, see paragraph 3.4.3 "Alignment of the coupling".

3.4.2 Assembling a pump unit

If the pump and the electric motor still have to be assembled, do the following:

1 Fit both halves of the coupling to the pump shaft and the motor shaft respectively.

2 If size **db** of the pump, see figure 30, is not equal to the IEC size of the motor, level up the difference by placing properly sized spacers under the pump or under the motor feet.

3 Place the pump on the base plate. Fix the pump to the base plate.

4 Place the electric motor on the base plate. Move the motor to obtain a gap of 3 mm between both coupling halves.

5 Place copper shims under the feet of the electric motor. Fix the electric motor to the base plate.

6 Align the coupling in accordance with the following instructions.

3.4.3 Alignment of the coupling

1 Place a ruler (A) on the coupling. Place or remove as many copper shims as is necessary to bring the electric motor to the correct height so that the straight edge touches both coupling halves over the entire length, see figure 3.

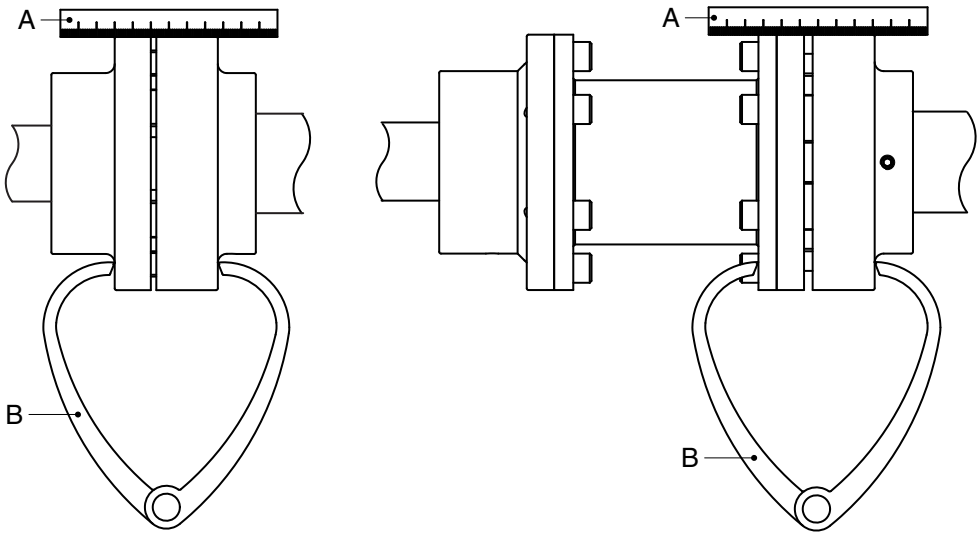


Figure 3: Aligning the coupling by means of a ruler and a pair of outside calipers.

2 Repeat the same check on both sides of the coupling at the height of the shaft. Move the electric motor so that the straight edge touches both coupling halves over the entire length.

3 Check the alignment once again using a pair of external callipers (B) at 2 diametrical opposite points on the sides of the coupling halves, see figure 3.

4 Fit the guard. See paragraph 7.6.4 "Assembling the guard".

3.4.4 Tolerances for aligning the coupling

The maximum allowable tolerances for the alignment of the coupling halves are shown in Table 2. See also figure 4.

Table 2: Alignment tolerances

External diameter of coupling [mm]	V				Va_{max} - Va_{min} [mm]	Vr_{max} [mm]
	min [mm]		max [mm]			
81-95	2	5*	4	6*	0,15	0,15
96-110	2	5*	4	6*	0,18	0,18
111-130	2	5*	4	6*	0,21	0,21
131-140	2	5*	4	6*	0,24	0,24
141-160	2	6*	6	7*	0,27	0,27
161-180	2	6*	6	7*	0,30	0,30
181-200	2	6*	6	7*	0,34	0,34
201-225	2	6*	6	7*	0,38	0,38

*) = coupling with spacer

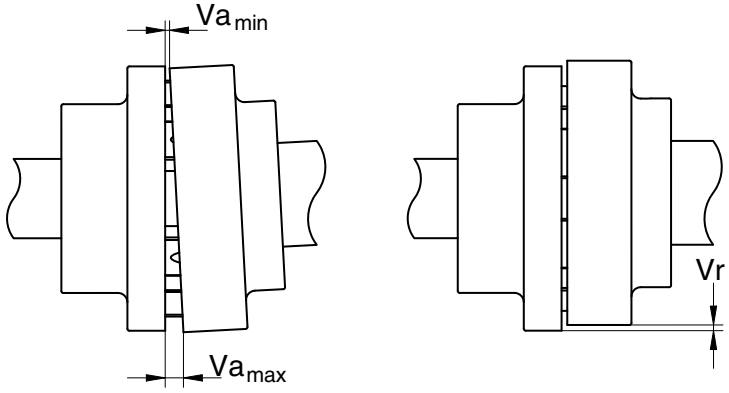


Figure 4: Alignment tolerances standard coupling.

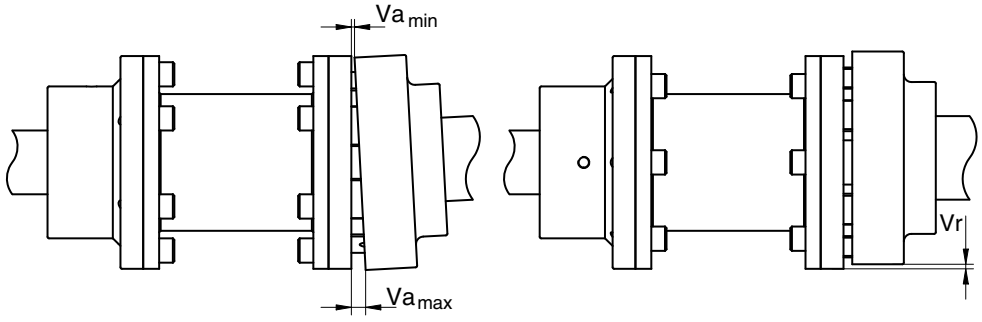


figure 5: Alignment tolerances spacer coupling.

3.5 Piping

- The piping to the suction and delivery connections must fit exactly and must not be subject to stress during operation. For the maximum allowable forces and moments on the pump flanges see paragraph 10.4 "Permissible forces and moments on the flanges".
- The passage of the suction pipe must be amply dimensioned. This pipe should be as short as possible and run towards the pump in such a way that no air pockets can arise. If this is not possible, a venting facility should be provided at the highest point of the pipe. If the inside diameter of the suction pipe is larger than the suction connection of the pump, an eccentric reducer should be applied to prevent air pockets and whirls. See figure 6.

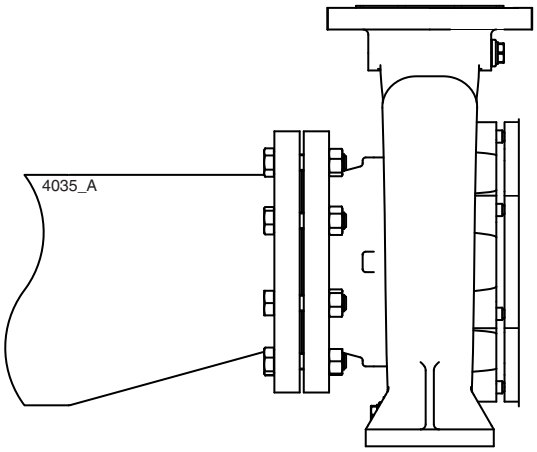


Figure 6: Eccentric reducer to suction flange.

- The maximum allowable system pressure is stated in paragraph 2.6 "Application area". If there is a risk that this pressure might be exceeded, for instance because of an excessive inlet pressure, appropriate measures should be taken by mounting a safety valve in the piping.
- Sudden changes in the rate of flow can lead to high pressure impulses in the pump and the piping (water shock). Therefore, do not use quick-acting closing devices, valves etc.

3.6 Accessories

- Fit any parts that may have been supplied separately.
- It is recommended to always mount a check valve and a shut-off valve in the suction pipe, as close as possible to the pump. If there is no check valve, the pump can only be started with closed delivery valve.
- In case of possible pre-pressure on the suction side, mount a shut-off valve in the suction pipe.
- If the liquid does not flow towards the pump, fit a foot valve at the bottom of the suction pipe. If necessary, combine this foot valve with a suction strainer to prevent impurities from being drawn in.
- When mounting, place temporarily (for the first 24 operating hours) a fine gauze between suction flange and suction pipe to prevent internal pump parts from being damaged by foreign matter. If the risk of damage continues to exist, fit a permanent filter.

3.7 Vacuum pump with service liquid tank

3.7.1 Mounting of accessories

- Connect a pipe to the overflow of the service liquid tank to discharge excess service liquid and extracted air.
- The pump is supplied with the exhaust pipe connected to the pump cover.

3.7.2 Connection diagram with service liquid tank

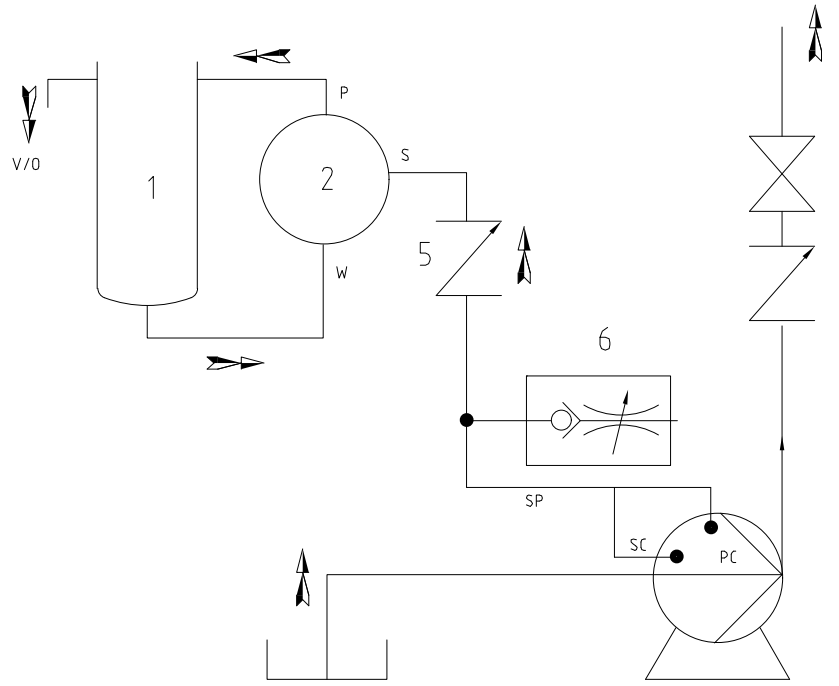


Figure 7: Connection diagram with service liquid tank.

3.7.3 Indication of connections

The suction, delivery and service liquid connections of the vacuum pump are indicated both on the drawings and on the vacuum pump by the letters **S, P** and **W**. Suction point **PC** is the connection to the space behind the impeller.

Indications used in figure 7 through figure 11:

V/O	De-aeration / Overflow
S	Inlet vacuum pump
SP	Exhaust pipe
P	Outlet vacuum pump
W	Service liquid
PC	Pump connection (=air-extraction connection centrifugal pump)
SF	Filter in suction pipe (only in figure 9)
SC	Suction flange connection
1	Service liquid tank
2	Vacuum pump
5	Check valve
6	Air inlet valve

3.7.4 Installation examples with service liquid tank

For a few situations is shown how pumps with a service liquid tank can be installed.

! **Excess service liquid must always be discharged to the suction tank separately.**

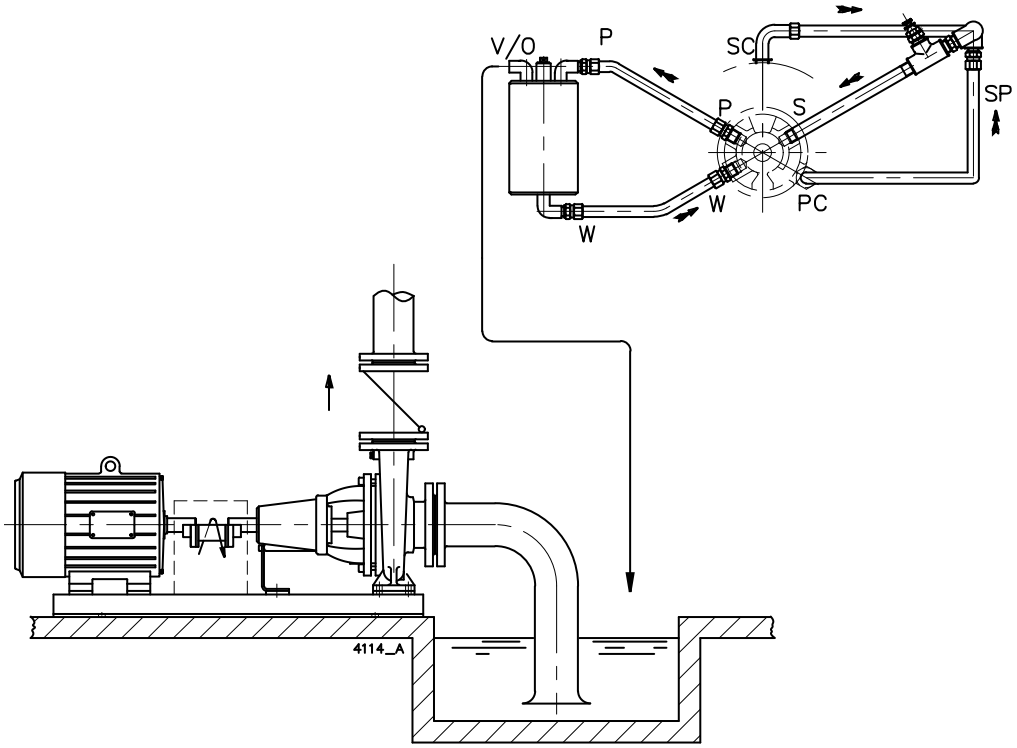


Figure 8: Medium: thin, clean and slightly polluted liquids.

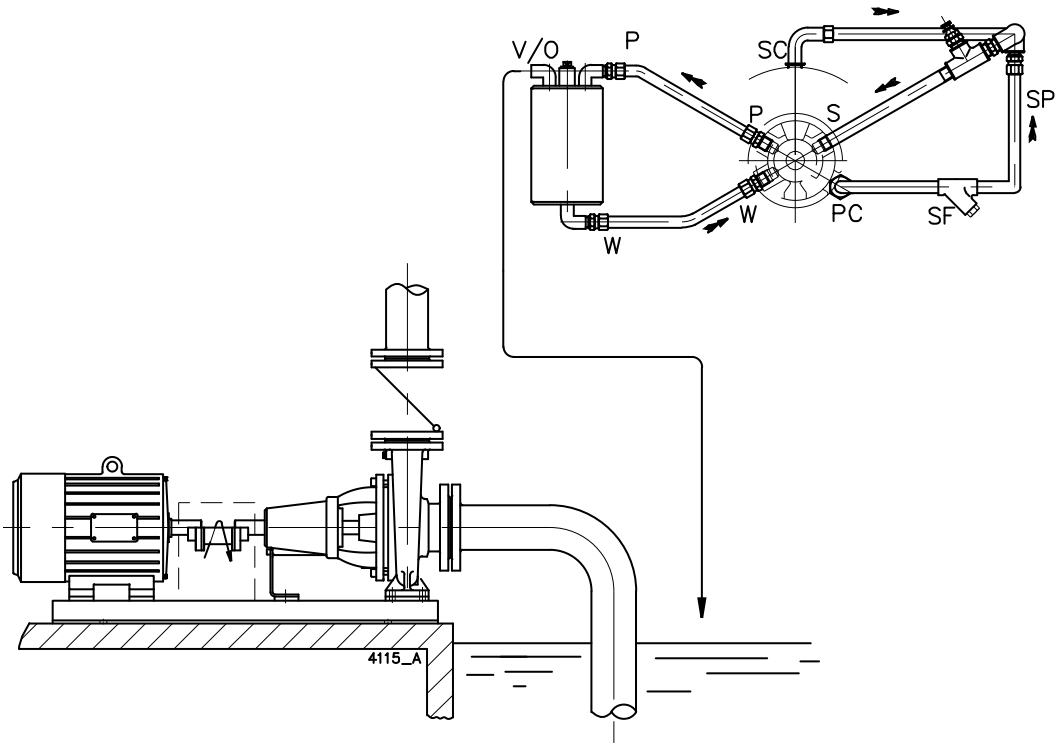


Figure 9: Medium: thin liquids, polluted with highly abrasive constituents. The back blades on the centrifugal impeller prevent heavy abrasive matter from getting into the suction space behind the impeller. To prevent floating abrasive matter from penetrating the pump, mount a filter in the suction pipe. The straining capacity of the filter should correspond with the nature of the pollutants. If necessary, mount several filters with different sieve sizes behind each other. Use at least one filter with Rp 3/4" connections and a sieve size of 0,6 mm.

! **Clean the filters regularly.**

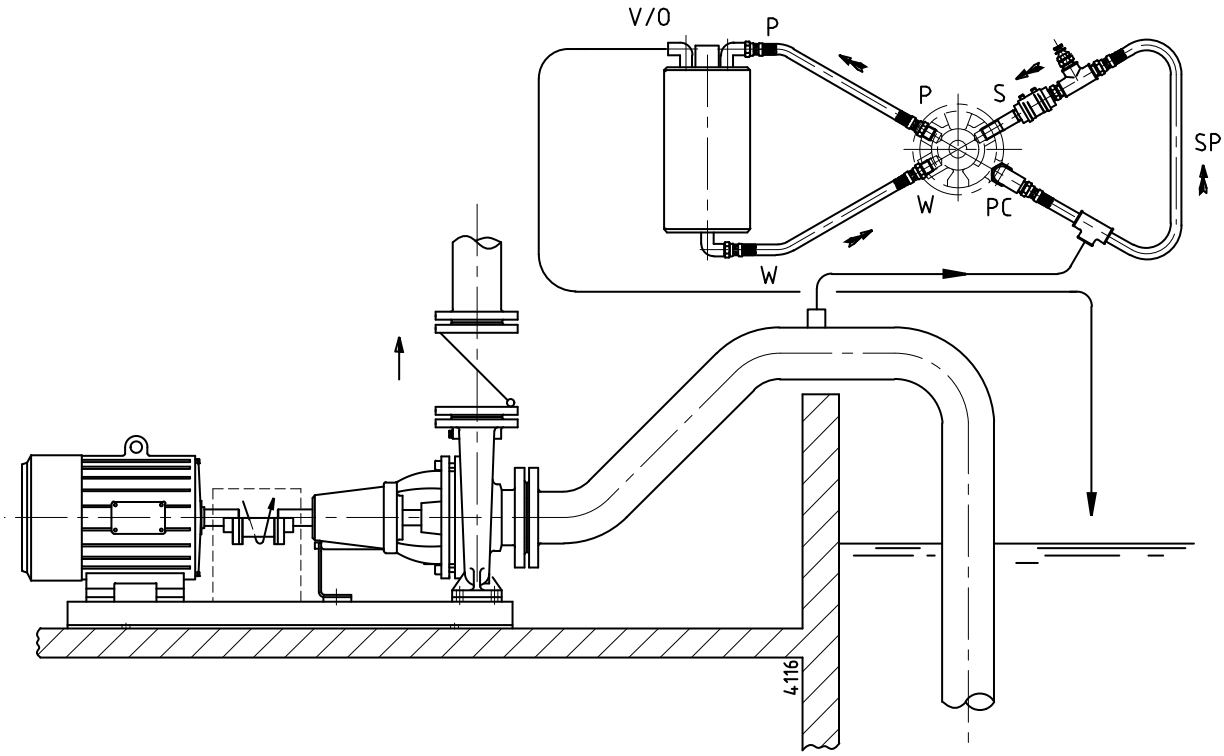


Figure 10: Medium: thin, clean and slightly polluted liquids. In case part of the suction pipe lies higher than the pump, venting should also be provided in this part. If the suction pipe is short, or the lift in the suction pipe small, venting at the highest point is not necessary. However, the suction time will be longer.

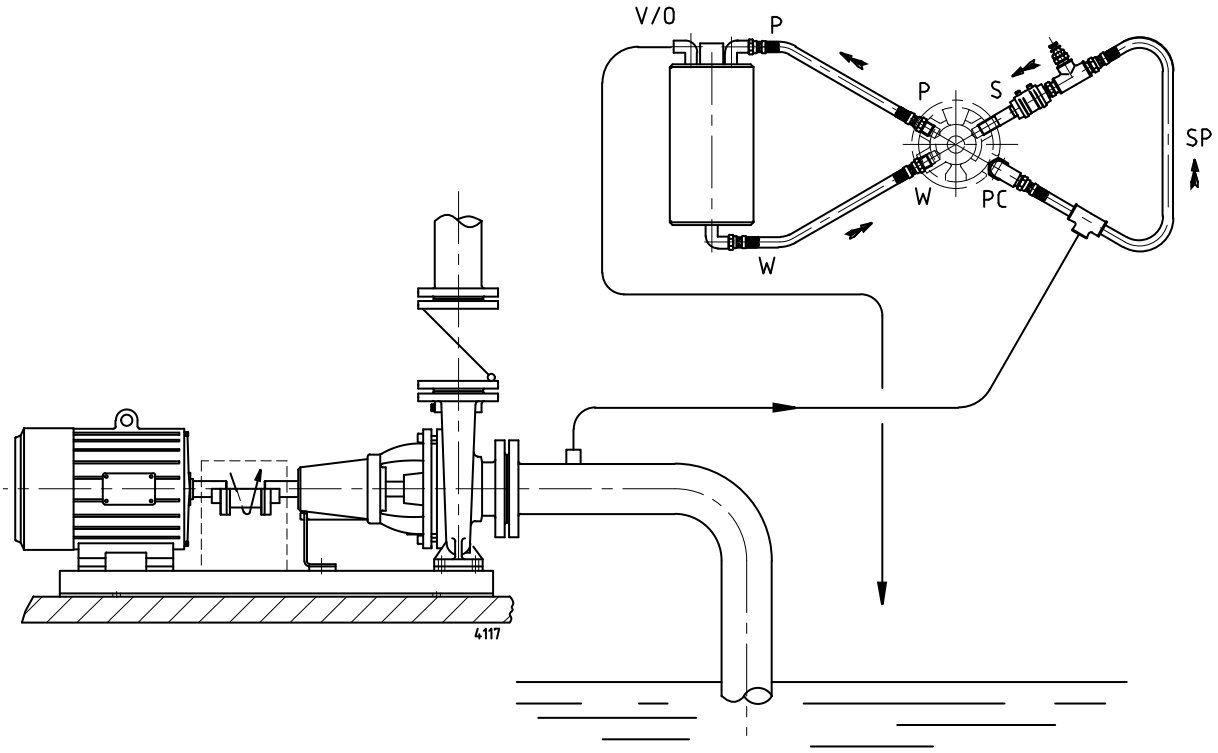


Figure 11: Medium: thin, clean and slightly polluted liquids. In case of long suction pipes (10 m or more) and a high suction head (4-7 m), also the suction pipe must be vented.

3.8 Vacuum pump with float-controlled de-aerator

3.8.1 Mounting of accessories

- Connect the exhaust pipe of the float-controlled de-aerator to the suction pipe. The passage of the exhaust pipe must be approx. 12 mm and the connection to the suction pipe at least G1/2".
- The pump is supplied with the exhaust pipe connected to the pump cover.

3.8.2 Connection diagram with float-controlled de-aerator

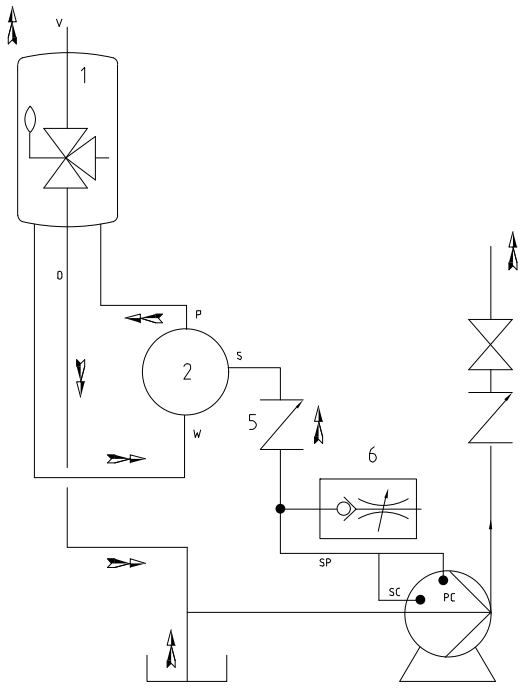


Figure 12: Connection diagram with float-controlled de-aerator.

3.8.3 Indication of connections

The suction, delivery and service liquid connections of the vacuum pump are indicated both on the drawings and on the vacuum pump by the letters **S, P** and **W**.
Suction point **PC** is the connection to the space behind the impeller.

Indications used in figure 12 through figure 16:

V/O	De-aeration / Overflow
S	Inlet vacuum pump
SP	Exhaust pipe
P	Outlet vacuum pump
W	Service liquid
PC	Pump connection (=air-extraction connection centrifugal pump)
SF	Filter in exhaust pipe (only in figure 14)
SC	Suction flange connection
1	Float-controlled de-aerator
2	Vacuum pump
5	Check valve
6	Air inlet valve

3.8.4 Installation examples with float-controlled de-aerator

For a few situations is shown how pumps with a float-controlled de-aerator can be installed.

! The excess service liquid is always returned to the suction pipe.

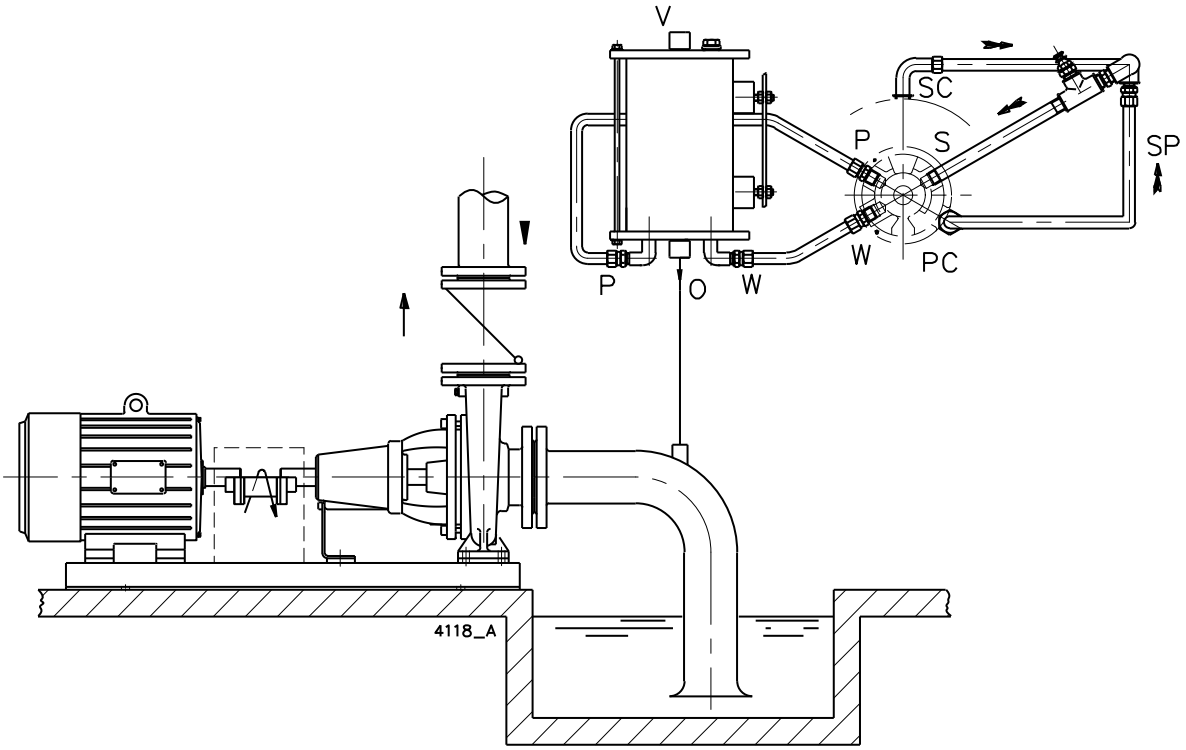


Figure 13: Medium: thin, clean and slightly polluted liquids.

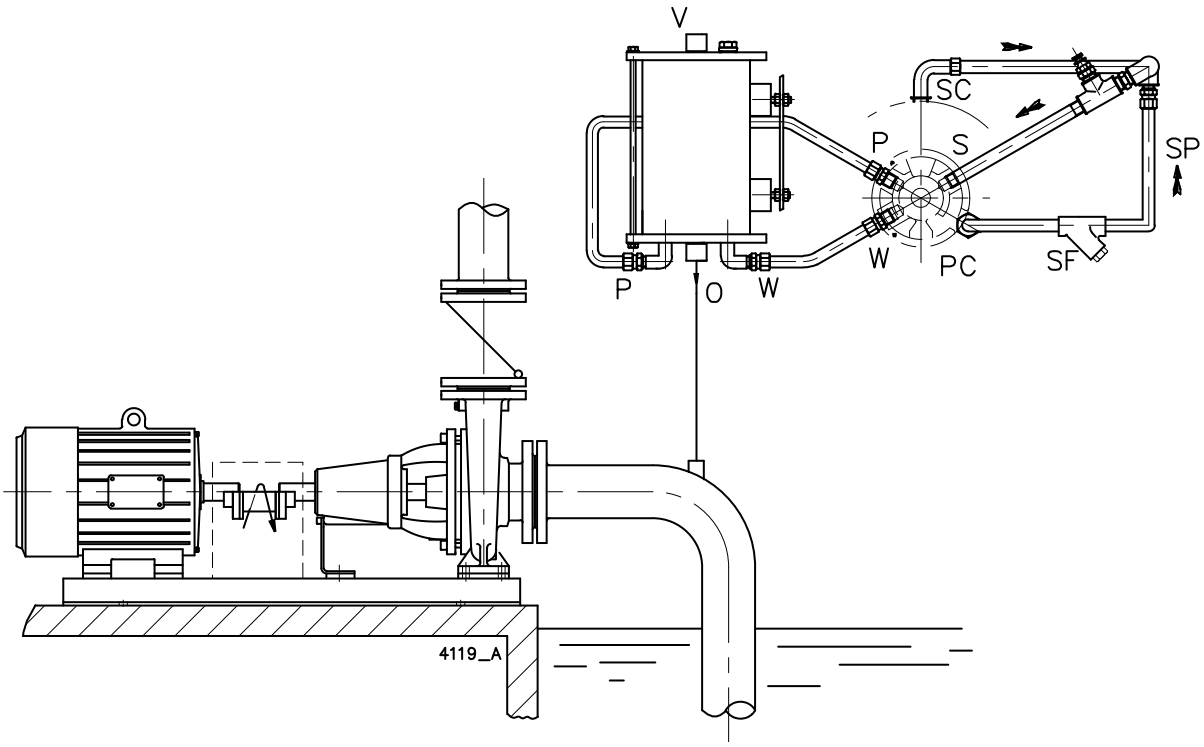


Figure 14: Medium: thin liquids polluted with highly abrasive matter. The back blades on the centrifugal impeller prevent heavy abrasive matter from getting into the suction space behind the impeller. To prevent floating abrasive matter from penetrating the pump, mount a filter in the suction pipe. The straining capacity of the filter should correspond with the nature of the pollutant. If necessary, mount several filters with different sieve sizes behind each other. Use at least one filter with Rp 3/4" connections and a sieve size of 0,6 mm.

! Clean the filters regularly.

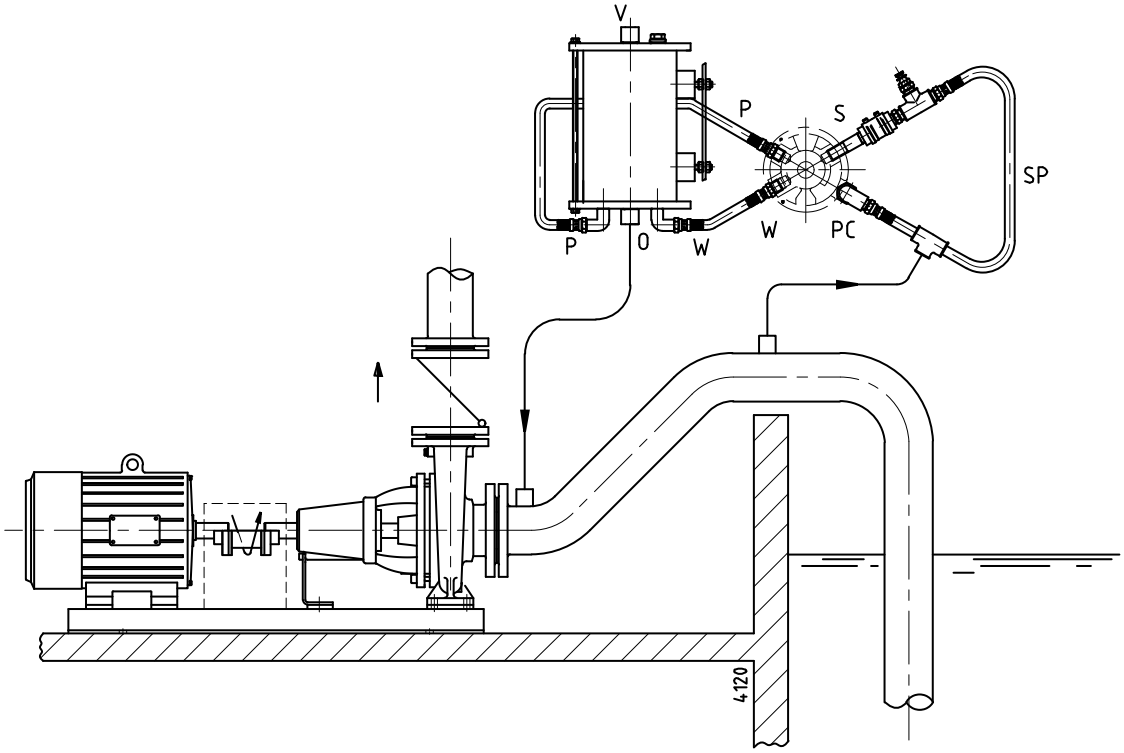


Figure 15: Medium: thin, clean and slightly polluted liquids. In case part of the suction pipe lies higher than the pump, venting should also be provided in this part. If the suction pipe is short, or the lift in the suction pipe small, venting at the highest point is not necessary. However, the suction time will be longer.

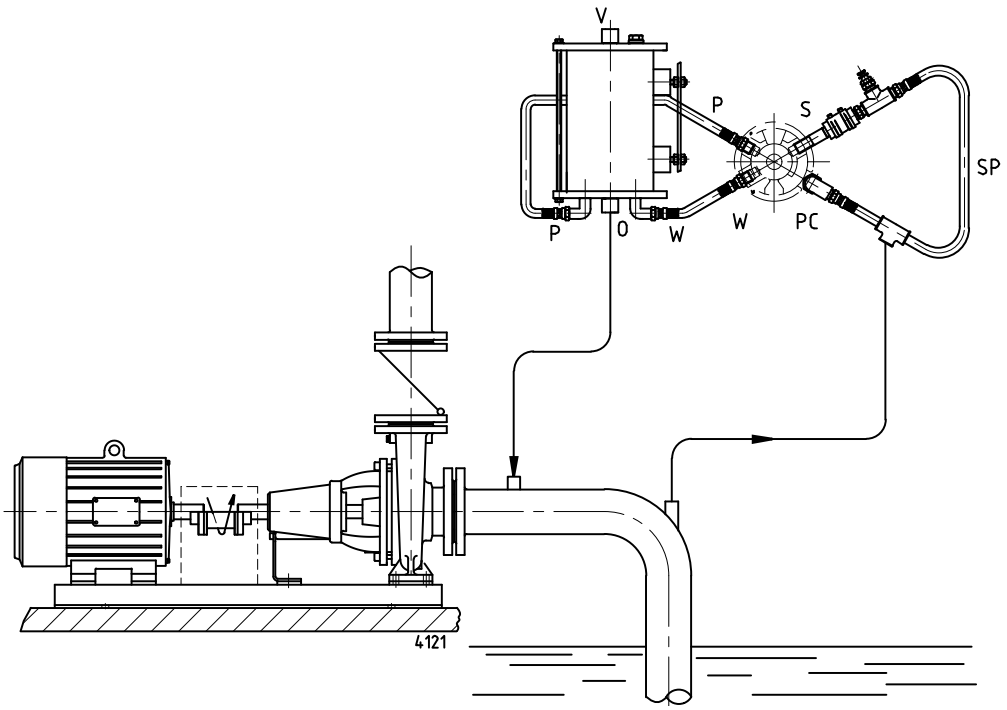


Figure 16: Medium: thin, clean and slightly polluted liquids. In case of long suction pipes (10 m or more) and a high suction head (4 -7 m), also the suction pipe must be vented.

3.9 Connection of the electric motor

⚠ ***The electric motor must be connected to the mains by an approved electrician, according to the locally prevailing regulations of the electricity company.***

- Refer to the instruction manual belonging to the electric motor.
- If possible, fit a working switch as close as possible to the pump.

3.10 Combustion engine

3.10.1 Safety

If the pump set is designed with a combustion engine, the manual for the engine should be included in the delivery. If the manual is missing we urgently request you to contact us immediately. Irrespective of the manual, the following points should be observed for all combustion engines:

- Comply with the local safety regulations.
- The exhaust of combustion gases must be screened off to prevent incidental contact.
- The starting device should automatically be disengaged after the engine has been started.
- The maximum speed of the engine set by us should **not** be changed.
- Before starting the engine check the oil level.

3.10.2 Sense of rotation

The sense of rotation of combustion engine and pump is indicated by means of an arrow on the combustion engine and the pump casing. Verify whether the sense of rotation of the combustion engine is the same as that of the pump.

4 Commissioning

4.1 Inspection of the pump

Check whether the pump shaft turns freely. Do this by turning the shaft end at the coupling a few times by hand.

4.2 Inspection vacuum pump part

1 Check whether all piping between the pump wheel casing and the service liquid tank (version TL) or the float-controlled de-aerator (version VL) have been connected.

2 Fill the service liquid tank or the float-controlled de-aerator with liquid and close them with plug (1690) or (3013) respectively.

4.3 Inspection of the motor

Pump driven by an electric motor:

- Check whether the fuses have been mounted.

Pump driven by a combustion engine:

- Check whether the room in which the engine is placed is well ventilated.
- Check whether the exhaust of the engine is not obstructed.
- Before starting the engine check the oil level.
- **Never run the engine in a closed room.**

4.4 Checking the sense of rotation

⚠ ***Beware of possible non-screened rotating parts, when checking the sense of rotation!***

1 The sense of rotation of the pump is indicated by an arrow. Check whether the sense of rotation of the motor corresponds with that of the pump.

2 Let the motor run for only a short time and check the sense of rotation.

3 If the sense of rotation is **not** correct, alter the sense of rotation. See the instructions in the user manual belonging to the electric motor.

4 Fit the guard.

4.5 Start-up

Proceed as follows, both when the pump is put into operation for the first time and when it is re-mounted after repairs.

1 Close the air-inlet valve (1650).

2 Fully open the stop valve in the suction pipe. Close the delivery stop valve.

3 Start the pump.

4 As soon as the pump is under pressure, slowly open the delivery stop valve until the working pressure is attained.

⚠ ***Make sure that when a pump is running, rotating parts are always properly screened off by the guard!***

4.6 Adjusting the air-inlet valve

The air-inlet valve (1650) serves to admit small quantities of air into the self- priming system. The vacuum pump has been designed to pump a large quantity of air. After the suction phase, the vacuum pump functions as liquid pump. However, in principle it is not designed to only pump liquid. By adding a small quantity of air through the air-inlet valve, it is possible to avoid problems. After the pump has been started with closed air-inlet valve, the valve is adjusted as follows:

1 When the suction phase is over and the centrifugal pump maintains the liquid flow on its own, the pump will start making a crackling noise.

2 Slowly open the air-inlet valve until the crackling stops.

3 Leave the valve in this position and secure it with a lock nut. The valve is now properly adjusted. Provided the system conditions do not change, the pump can be reconnected after a break without having to readjust the valve.

4.7 Mechanical seal

A mechanical seal nor the lip seals may never show any visible leakage.

4.8 Pump in operation

When the pump is in operation, pay attention to the following:

- The pump may never run without liquid in the service liquid tank or the float-controlled de-aerator.
- Never use a stop valve in the suction line to control pump output. The stop valve should always be fully opened during operation.
- Check whether the absolute inlet pressure is sufficient, to prevent vaporization in the pump.
- Check whether the pressure difference between suction and delivery side corresponds with the specifications of the pump's duty point.

4.9 Noise

The noise production of a pump depends to a great extent on the operating conditions. The values stated in paragraph 10.7 "Noise data" are based on normal operation of the pump, driven by an electric motor. In case the pump is driven by a combustion engine, or in case it is used outside the normal operation area, as well as in case of cavitation, the noise level may exceed 85 dB(A). In that case precautions should be taken, like building a noise-barrier around the unit or wearing hearing protection.

5 Maintenance

5.1 Daily maintenance

Regularly check the outlet pressure.

⚠ ***No water should get into the terminal box of the electric motor when the pump room is sprayed clean! Never spray water on hot pump parts! The sudden cooling down may cause them to burst and hot water may flow out!***

5.2 Service liquid

After the pump has been put into operation once, the working-liquid tank and the float-controlled de-aerator don't have to be filled up again: there is constantly a sufficient quantity of pumped liquid in the working-liquid tank and the float- controlled de-aerator.

5.3 Shaft sealing

5.3.1 Mechanical seal

A mechanical seal generally requires no maintenance, however, **it should never be allowed to run dry**. If there are no problems, do not dismantle the mechanical seal. As the seal faces have run in on one another dismantling usually implicates replacement of the mechanical seal. If a mechanical seal shows any leakage it has to be replaced.

5.3.2 Lip seal

The lip seals generally require no maintenance. The lip seals run around stainless steel shaft sleeves which are provided with a hard wearing layer. The space between the lip seals is filled with grease when they are mounted, so as to limit wearing to a minimum. When the lip seals are leaking they have to be replaced.

5.4 Lubrication of the bearings

The bearings requires re-greasing after every 1000 hours of operation. The bearings are filled with grease during assembly. In case the pump is overhauled, the bearing bracket and the bearings have to be cleaned and provided with new grease. For recommended greases and quantities see paragraph 10.1 "Recommended greases"

5.5 Environmental influences

- Regularly clean the filter in the suction pipe or the suction strainer at the bottom of the suction pipe, as the inlet pressure may become too low if the filter or the suction strainer is fouled.
- If there is a risk that the pumped liquid expands during solidification or freezing, the pump has to be drained and, if necessary, flushed after it has been put out of service.
- If the pump is out of service for a long time, it has to be preserved.

5.6 Noise

If a pump starts making noise, this may point to certain problems with the pump unit. A crackling noise can indicate cavitation or excessive motor noise can indicate deterioration of the bearings.

5.7 Faults

⚠ ***The pump, of which you want to determine the fault, may be hot or under pressure. Take the appropriate precautions first and protect yourself with the proper safety devices (safety goggles, gloves, protective clothing)!***

To determine the source of the malfunctioning of the pump, proceed as follows:

1 Switch off the power supply to the pump unit. Lock the working switch with a padlock or remove the fuse. In case of a combustion engine: switch off the engine and close the fuel supply to the engine.

2 Close the stop valves.

3 Determine the nature of the fault.

4 Try to determine the cause of the fault with chapter 6 "Problem solving" and take the appropriate measures or contact your installer.

6 Problem solving

Faults in a pump installation can have various causes. The fault may not be in the pump, it may also be caused by the pipe system or the operating conditions. Firstly, always check that installation has been executed in accordance with the instructions in this manual and that the operating conditions still correspond with the specifications for which the pump was purchased.

In general, breakdowns in a pump installation are attributable to the following causes:

- Faults with the pump.
- Breakdowns or faults in the pipe system.
- Faults due to incorrect installation or commissioning.
- Faults due to incorrect choice of pump.

A number of the most frequently occurring failures as well as their possible causes are shown in the table below.

Table 3: Most frequently occurring failures.

Most common faults	**Possible causes, see Table 4.**
Pump delivers no liquid	1 4 8 9 10 11 13 14 17 19 20 21 29
Pump has insufficient volume flow	2 3 4 8 9 10 11 13 14 15 17 19 20 21 28 29 44
Pump has insufficient head	2 4 13 14 17 19 28 29
Pump stops after start up	1 8 9 10 11
Pump has higher power consumption than normal	12 15 16 17 18 22 23 24 25 26 27 32 34 38 39
Pump has lower power consumption than normal	3 14 15 16 17 18 20 21 28 29 44
Mechanical seals have to be replaced to often	23 25 26 30 32 33 34
Pump vibrates or is noisy	9 10 11 15 18 19 20 22 23 24 25 26 27 29 37 38 39 40 43
Bearings wear too much or become hot	23 24 25 26 27 37 38 39 40 42
Pump running rough hot or seizes	23 24 25 26 27 34 37 38 39 40 42

Table 4: Possible causes of pump failures.

	Possible causes
1	Service liquid tank or float de-aerator not filled with liquid
2	Gas or air coming from the liquid
3	Air lock in the suction pipe
4	Air leak in the suction pipe
8	The manometric suction head is too high
9	Suction pipe or suction strainer is blocked
10	Insufficient immersion of foot valve or suction pipe during operation of the pump
11	NPSH available too low
12	Speed too high
13	Speed too low
14	Wrong sense of rotation
15	Pump does not operate at the right duty point
16	Liquid density differs from the calculated liquid density
17	Liquid viscosity differs from the calculated liquid viscosity
18	Pump operates when the liquid flow is too low
19	Wrong pump selection
20	Obstruction in impeller or pump casing
21	Obstruction in the piping
22	Wrong installation of the pump unit
23	Pump and motor not well aligned
24	Rotating part running out of true
25	Imbalance in rotating parts (for instance: impeller or coupling)
26	Pump shaft is running out of true
27	Bearings faulty or worn out
28	Wear ring faulty or worn out
29	Damaged impeller
30	Seal faces of the mechanical seal are worn out or damaged
32	Bad mounting of the mechanical seals or of the lip seals
33	Mechanical seals or lip seals not suitable for the pumped liquid or operation circumstances
34	Pump wheel cover not perpendicularly mounted
37	Axial retaining of impeller or pump shaft is defective
38	The bearings have been mounted wrongly
39	Too much or too little bearing lubrication
40	Wrong or polluted lubricant
42	Too high axial force because of worn dorsal blades or excessive inlet pressure
43	Air-inlet valve closed
44	Air-inlet valve opened too much

7 Disassembly and assembly

7.1 Precautionary measures

⚠ ***Take adequate measures to avoid that the motor is started while you are working on the pump. This is especially important for electric motors with remote control:***

- Switch the operating switch near the pump (if available) to "OFF".
- Switch off the pump switch on the switchboard.
- If necessary remove the fuses.
- Hang a danger board near the switchboard cabinet.

7.2 Special tools

Assembly and disassembly work requires no special tools. However, such tools can make certain jobs easier, for instance replacing the shaft seal. If such is the case it will be indicated in the text.

7.3 Liquid draining

! **Make sure no liquid or oil gets into the environment!**

Before starting any disassembly the pump should be drained.

1 If necessary, close the valves in the suction and delivery pipe and in the flushing or cooling supply lines to the shaft seal. Also drain the self-priming section by disconnecting the piping P, S and W.

2 Remove the drain plug (0310).

3 If harmful liquids are pumped wear protective gloves, shoes, glasses, etc., and thoroughly flush the pump.

4 Refit the drain plug.

⚠ ***If possible, wear protective gloves. Regular contact with oil products may result in allergic reactions.***

7.4 Item numbers

If no specific figure numbers are stated, then the item numbers used in these instructions refer to the cross section drawings and parts lists, which can be found in chapter 9 "Parts".

The connection markings P, S and W on the self-priming section are explained in paragraph 3.7.3 "Indication of connections" for the Service liquid tank configuration TL or paragraph 3.8.3 "Indication of connections" for the Float Deaerator configuration VL.

7.5 Constructive variants

The pumps can be supplied in 2 constructive variants and with 2 processing liquid devices. The variants have a special code, which is stated in the type designation on the type plate on the pump.

M2	Mechanical seal, unbalanced, shaft sleeve
M4	Lip seals, hardened shaft sleeves
TL	Processing liquid tank and air-inlet valve
VL	Float-operated de-aerator and air-inlet valve

7.6 Back-Pull-Out system

The pumps are designed with a Back-Pull-Out system. If the pump unit is designed with a spacer-coupling, just remove the spacer. After that the bearing bracket with the entire rotating part can be removed. This means that almost the whole pump can be dismantled without having to detach the suction and delivery piping. The motor remains in its position.

If the pump unit does not have a spacer coupling, the motor has to be removed from the foundation before disassembly.

7.6.1 Disassembling the guard

1 Loosen bolts (0960). See figure 20.

2 Remove both jackets (0270). See figure 18.

7.6.2 Disassembling the Back-Pull-Out unit

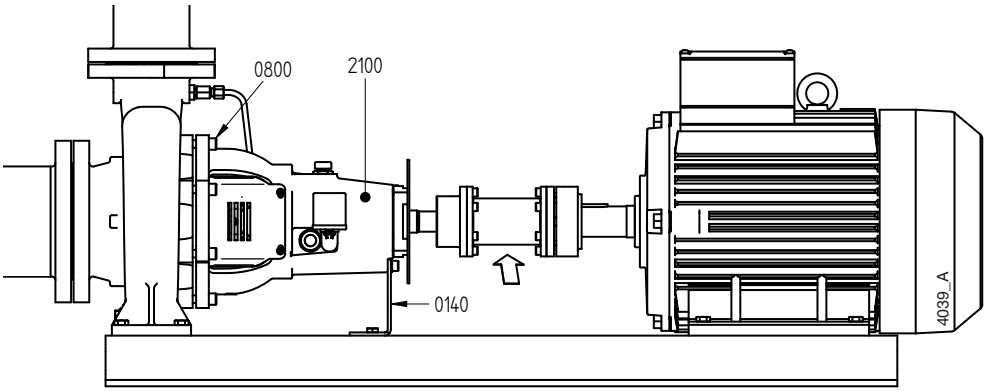


Figure 17: Back-Pull-Out principle.

1 Mounted with spacer coupling: Remove the spacer. Else: Remove the electric motor.

2 Disconnect the connections S, P and W from the pump wheel casing.

3 Loosen the bracket support (0140) from the base plate, see figure 17.

4 Remove the Allen screws (0800).

5 Pull the entire bearing bracket (2100) from the pump casing. The entire bearing bracket of large pumps is very heavy. Support it with a beam or hang it in a pulley sling.

6 Remove the coupling half from the pump shaft and remove the coupling key (2210).

7 Unscrew bolts (0940) and remove the assembly plate (0275) from the adjusting bush (2240). See figure 21.

7.6.3 Assembling Back-Pull-Out unit

1 Fit a new gasket (0300) into the pump casing and fit the entire bearing bracket back into the pump casing. Tighten the Allen screws (0800) crosswise.

2 Reconnect the connections S, P and W to the pump wheel casing.

3 Fix the bearing support (0140) on the base plate.

4 Fit the assembly plate (0275) to the adjusting bush (2240) with bolts (0940). See figure 21.

5 Fit the coupling key (2210) and fit the coupling half onto the pump shaft.

6 Place the motor back in its place or fit the spacer of the spacer coupling.

7 Check the alignment of pump and motor shaft, see paragraph 3.4.3 "Alignment of the coupling". If necessary, realign.

7.6.4 Assembling the guard

1 Fit the jacket (0270) at motor side. The annular groove must be located at motor side.

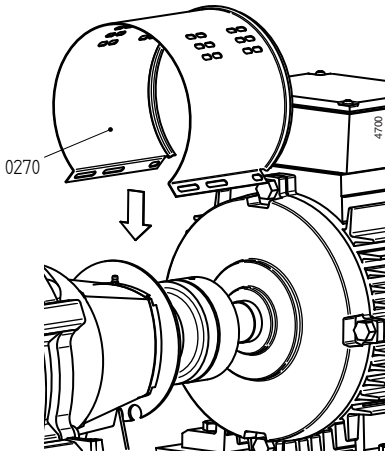


Figure 18: Fitting the jacket at motor side.

2 Place the assembly plate (0280) over the motor shaft and fit it into the annular groove of the jacket.

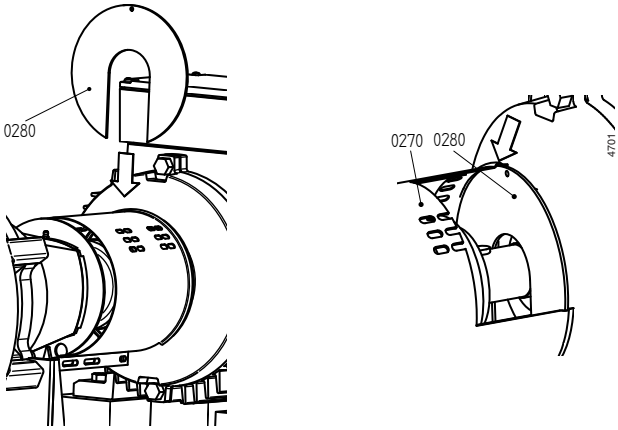


Figure 19: Fitting the assembly plate at motor side.

3 Close the jacket and fit bolt (0960). See figure 20.

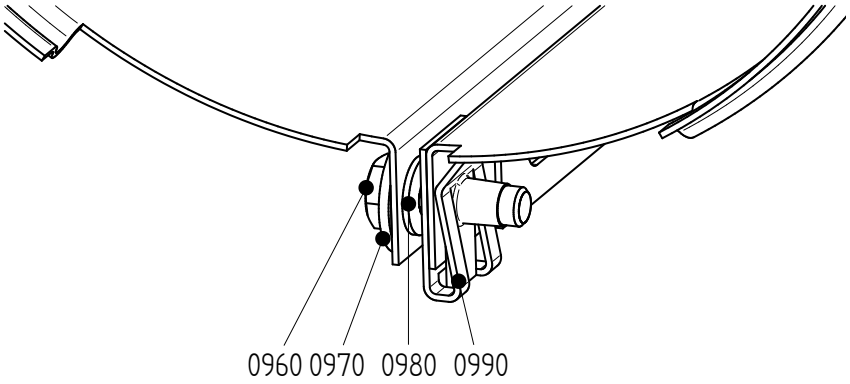


Figure 20: Fitting jacket.

4 Mount the jacket (0270) at pump side. Place it over the present jacket at motor side. The annular groove must be located at pump side.

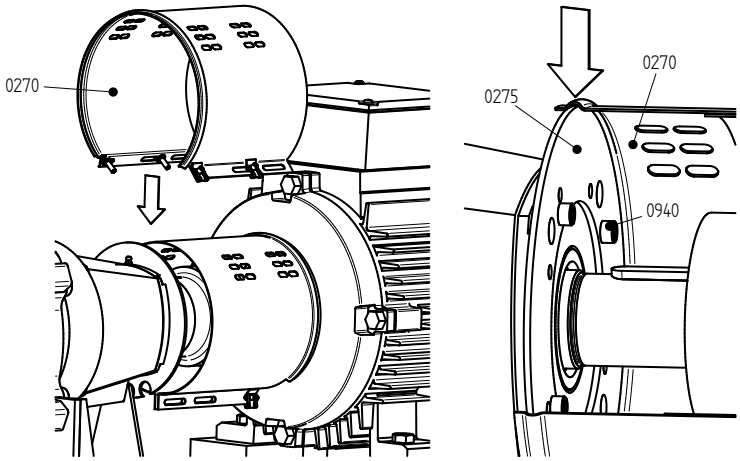


Figure 21: Fitting the jacket at pump side.

5 Close the jacket and fit bolt (0960). See figure 20.

6 Slide the jacket at motor side towards the motor as far as possible. Fix both jackets with bolt (0960).

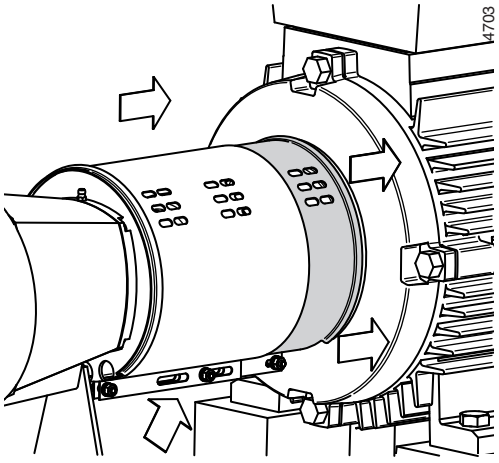
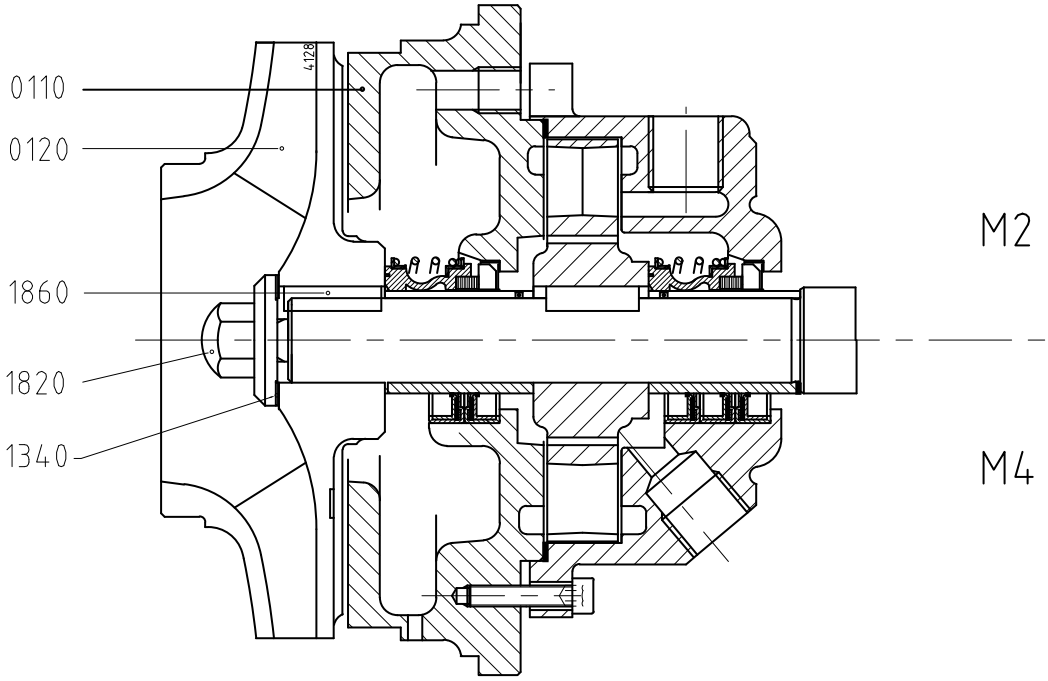


Figure 22: Adjusting the jacket at motor side.

7.7 Replacing the impeller and the wear ring

The play between the impeller and the wear ring is 0,3 mm to the diameter at delivery. In case the play has increased to 0,5-0,7 mm due to wear, the impeller and the wear ring should be replaced.

7.7.1 Disassembling the impeller



Figuur 23: Disassembling the impeller.

The item numbers used are referring to figure 23.

1 Remove the Back-Pull-Out unit, see paragraph 7.6.2 "Disassembling the Back-Pull-Out unit".
2 Remove the cap nut (1820) and the gasket (1340). Sometimes the nut has to be heated to break the Loctite-contact.
3 Remove the impeller (0120) with a pulley puller, or wrest the impeller by inserting for instance 2 big screwdrivers between the impeller and the stuffing box cover (0110).
4 Remove the impeller key (1860).
5 Remove the gasket (1940).

7.7.2 Mounting the impeller

1 Fit the gasket (1940).
2 Place the impeller key (1860) in the key way of the pump shaft.
3 Push the impeller onto the pump shaft.
4 Degrease the thread on the pump shaft and the thread in the cap nut.
5 Fit the gasket (1340).
6 Put a drop of Loctite 243 on the thread and fit the cap nut. For tightening moment of the nut see paragraph 10.3.2 "Tightening moments for cap nut".
7 Fit the Back-Pull-Out unit, see paragraph 7.6.3 "Assembling Back-Pull-Out unit".

7.7.3 Disassembling the wear ring

This only concerns bearing groups 2 and 3, except for types 40-250 and 50-250.

After removing the Back-Pull-Out unit (see paragraph 7.6.2 "Disassembling the Back-Pull-Out unit") the wear ring can be removed. In most cases the ring has been fixed so tightly that it cannot be removed undamaged.

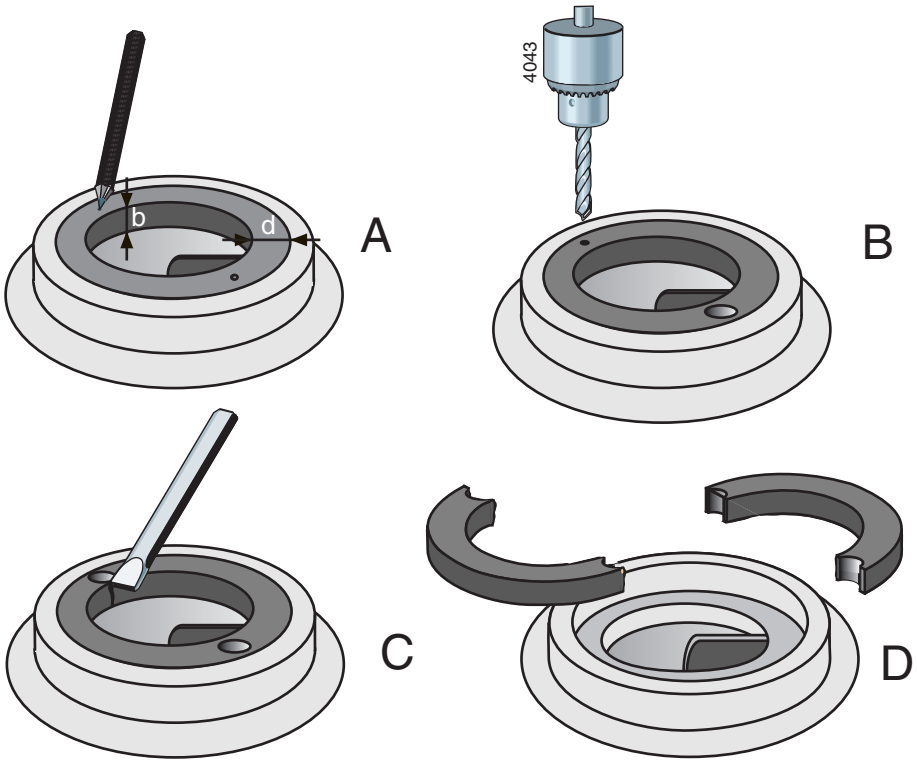


Figure 24: Removal of wear ring.

1 Measure the thickness (d) and the width (b) of the ring, see figure 24 A.

2 Make a centre hole in the middle of the edge of the ring at two opposite points, see figure 24 B.

3 Use a drill with a diameter just a little bit smaller than the thickness (d) of the ring and drill two holes in the ring, see figure 24 C. Don't drill deeper than the width (b) of the ring. Take care not to damage the fitting edge of the pump casing.

4 Use a chisel to cut the remaining part of the ring thickness. Now you can remove the ring in two parts from the pump casing, see figure 24 D.

5 Clean the pump casing and carefully remove all bore dust and metal splinters.

7.7.4 Assembling the wear ring

1 Clean and degrease the fitting edge of the pump casing where the wear ring is to be mounted.

2 Degrease the outer edge of the wear ring and put a few drops of Loctite 641 on it.

3 Fit the wear ring in the pump casing. **Take care it is not pushed out of alignment!**

7.8 Shaft sealing

7.8.1 Instructions for mounting a mechanical seal

➢ *First read the following instructions regarding the mounting of a mechanical seal. Follow these instructions closely when mounting a mechanical seal.*

- A mechanical seal is a fragile precision instrument. Leave the seal in its original packing until you are ready to fit it!
- Clean all receiving parts properly. Make sure your hands and working environment are clean!
- **Never touch the sliding surfaces with ones fingers!**
- Take care not to damage the seal during assembly. Never put the rings down on their sliding surfaces!

7.8.2 Disassembling a mechanical seal M2

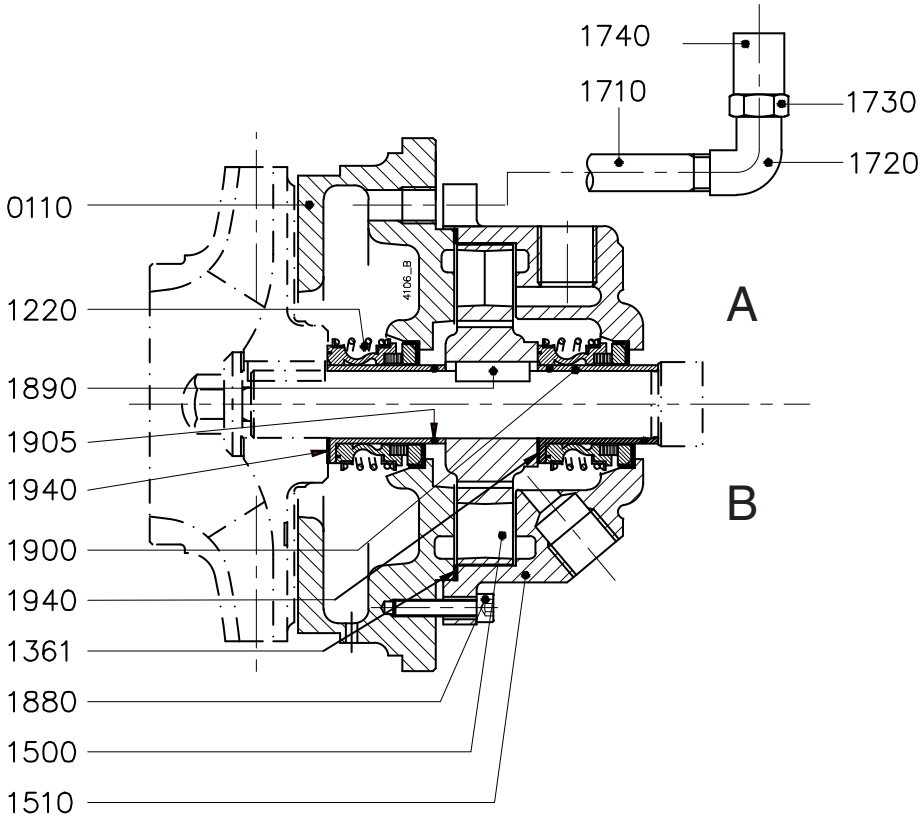


Figure 25: Mechanical seal M2 (A = bearing group 1 and 2, B = bearing group 3).

The item numbers used are referring to figure 25.

1 Remove the impeller, see paragraph 7.7.1 "Disassembling the impeller".
2 Pull the shaft sleeve (1900) off the pump shaft and remove the rotating part of the mechanical seal from the shaft sleeve.
Bearing group 3 only: Remove gasket (1940).
3 Mark the position of the pump cover (0110) in relation to the bearing bracket (2100).
4 Loosen the Allen screws (1880).
5 Push the cover of the pump wheel casing (1510) backward.

6 Knock the pump cover loose and push it off the pump shaft. Press the counter-ring of the mechanical seal out of it.

7 Pull the pump wheel (1500) from the pump shaft and remove the key (1890).

8 Pull the shaft sleeve (1900) from the pump shaft and remove the rotating part of the mechanical seal from the shaft sleeve.
Bearing group 3 only: Remove gasket (1940).

9 Push the cover of the pump wheel casing (1510) off the pump shaft and press the counter-ring out.

10 Remove gasket (1361).

11 Remove O-rings (1905) out of the shaft sleeves (1900).

7.8.3 Assembling of the mechanical seals M2

1 Ensure the shaft sleeve (1900) and the splash ring (2220) are undamaged. The splash ring should also clasp the pump shaft properly. If necessary, replace these parts.

2 Place the bearing bracket with the shaft upright.

3 Put the cover of the pump wheel casing (1510) and the pump cover (0110) flat down and press the counter-ring of the seal straight into it. If necessary, use a plastic pressure piece. **Never hammer it inside!** The maximum axial turn of the counter-ring is 0,1 mm.

4 Put some glycerine or silicon spray on the O-rings and mount the O-rings into the shaft sleeves.

5 Push the cover of the pump wheel casing (1510) over the pump shaft.

6 Wet the clean shaft sleeve with some low-surface-tension water (add detergent), feed the bellows with a slight twist in clockwise direction onto the shaft sleeve. **Use no oil or grease!** Apply pressure only on the corner rings.

7 Push a shaft sleeve (1900) on the pump shaft.

8 Bearing group 3 only: Fit a new gasket (1940).

9 Place the key (1890) in the pump shaft and push the pump wheel (1500) over the pump shaft.

10 Mount the gasket (1361).

11 Mount the pump cover (0110) in the right position into the fitting edge of the bearing bracket. Check whether the pump cover is at right angles to the pump shaft.

12 Mount the cover of the pump wheel casing (1510) against the pump cover. Watch its position in view of the connections. Tighten the Allen screws (1880) crosswise.
The cover should not be oblique.

13 Push the other shaft sleeve (1900) on the pump shaft.

14 Bearing group 3 only: Fit a new gasket (1940).

15 Fit the impeller and other parts, see paragraph 7.7.2 "Mounting the impeller".

7.8.4 Instructions for mounting a lip seal

- A lip seal is a fragile precision instrument. Leave the seal in its original packing until you are ready to fit it!
- Clean all receiving parts properly. Make sure your hands and working environment are clean!

7.8.5 Disassembling of the lip seals M4

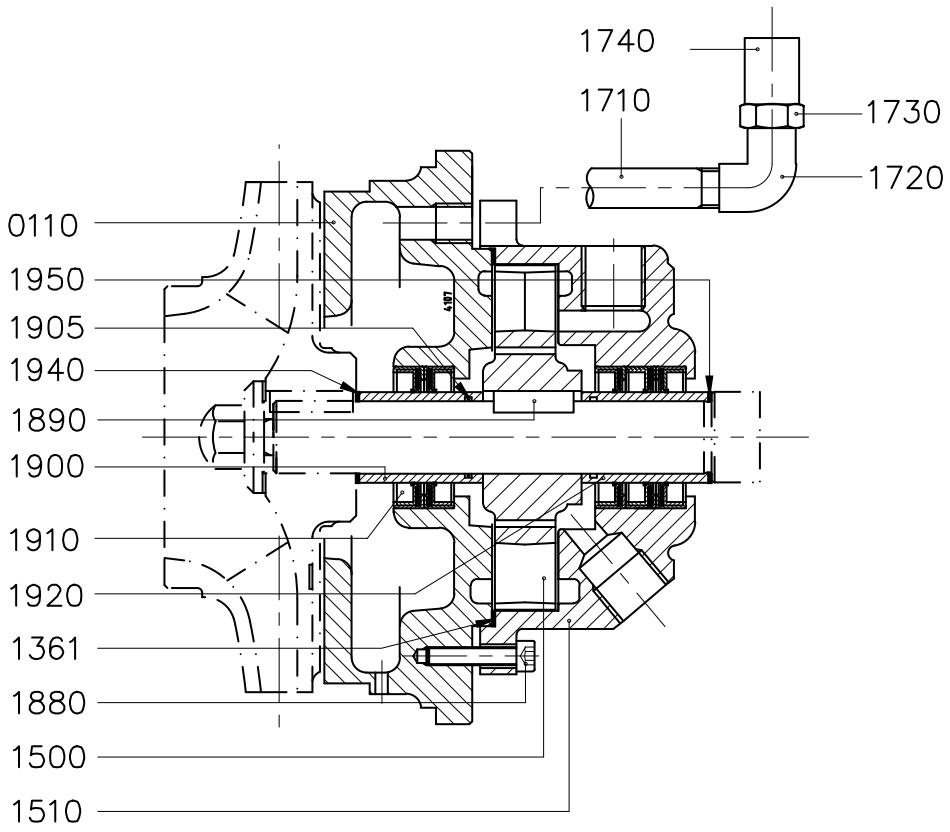


Figure 26: Lip seal M4.

The item numbers used are referring to figure 26.

1 Remove the impeller, see paragraph 7.7.1 "Disassembling the impeller".
2 Mark the position of the pump cover (0110) in relation to the bearing bracket (2100).
3 Loosen the Allen screws (1880).
4 Push the cover of the pump wheel casing (1510) backward.
5 Knock the pump cover loose and push it off the pump shaft. Remove the tabbed sealing rings (1910).
6 Pull the shaft sleeve (1900) from the pump shaft and remove the O-ring (1905).
7 Pull the pump wheel (1500) from the pump shaft and remove the sunk key (1890).
8 Slide the cover of the pump wheel casing (1510) off the pump shaft and remove the tabbed sealing rings.
9 Remove the gasket (1361).
10 Pull the shaft sleeve (1920) from the pump shaft.
11 Remove the gasket (1950) from the pump shaft.

7.8.6 Assembling of the lip seals M4

1 Check the shaft sleeves (1900 and 1920) and the splash ring (2220) for damages. Also, the splash ring should clasp the shaft properly. If necessary, replace these parts.

2 Place the bearing bracket with the shaft upright.

3 Mount the gasket (1950) around the pump shaft.

4 Slide the cover of the pump wheel casing (1510) onto the pump shaft.

5 Mount a lip seal on both ends of the shaft sleeve. The pointing direction of the tab should be opposite to the sliding direction. Shaft sleeve (1900) will have 2 lip seals, shaft sleeve (1920) will have 3. **When being mounted, the lip seals and the space between them both must be filled with grease.**

6 Slide the shaft sleeve (1920) onto the pump shaft.

7 Mount the sunk key (1890) in the pump shaft and slide the pump wheel casing (1500) onto the pump shaft.

8 Mount the pump cover (0110) in the right position in the fitting edge of the bearing bracket. Check the position of the pump cover. It should be at right angles to the pump shaft.

9 Mount the gasket (1361) between the pump cover and the pump wheel casing.

10 Mount the cover of the pump wheel casing (1510) against the pump cover. Watch the position in view of the place for the connections. Tighten the Allen screws (1880) crosswise. The cover should not be oblique.

11 Mount the O-ring (1905) into the shaft sleeve (1900) and slide the shaft sleeve onto the pump shaft.

12 Fit the impeller and the other parts, see paragraph 7.7.2 "Mounting the impeller".

7.9 Bearing

7.9.1 Disassembly of bearings and pump shaft

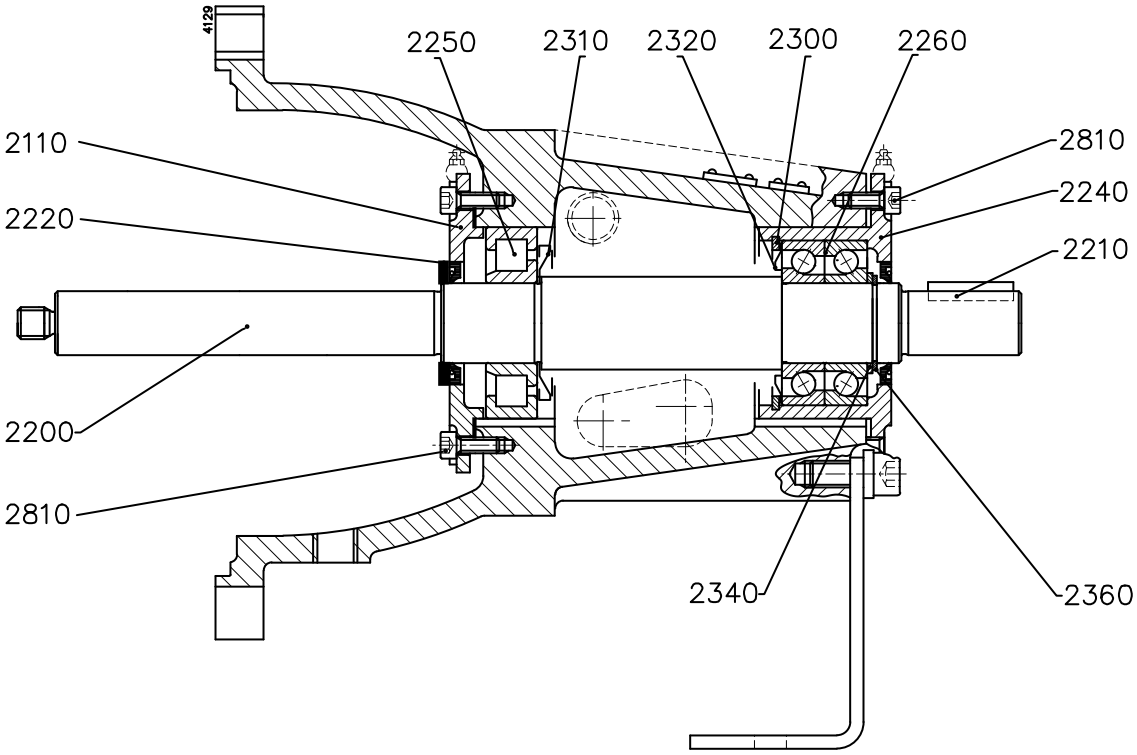


Figure 27: Bearing.

The item numbers used are referring to figure 27.

1 Remove the impeller and the shaft seal, see paragraph 7.7.1 "Disassembling the impeller" and paragraph 7.8.2 "Disassembling a mechanical seal M2" / paragraph 7.8.5 "Disassembling of the lip seals M4".

2 Remove the coupling guard, see paragraph 7.6.1 "Disassembling the guard".

3 Remove the splash ring (2220).

4 Remove the Allen screws (2810) and the bearing cover (2110).

5 Knock at the impeller side of the pump shaft (2200), until the adjusting bush (2240) with the bearings (2260) comes out of the bearing bracket. Use a plastic hammer so as to avoid damage to the thread. Remove the pump shaft with the bearings from the bearing bracket.

6 Remove the coupling with a coupling puller and remove the coupling key (2210).

7 Loosen bolts (0940) and remove the assembly plate (0275).

8 Remove the inner circlip (2300) and pull the adjusting bush (2240) off the bearings.

9 Remove the outer circlip (2360) and the adjusting ring (2340) and pull the bearings from the pump shaft with a suitable puller. If such a puller is not available, knock the inner raceway of the bearing carefully. Use a normal hammer and a soft-metal drift. **Never knock with a hammer directly on the bearing!**

10 Remove the Nilos rings (2310 and 2320).

7.9.2 Assembly of bearings and pump shaft

! **Make sure your working environment is clean and leave the bearings in their original packing until you are ready to mount them.**

1 Clean the interior of the bearing bracket properly.

2 Mount the Nilos rings (2310 and 2320) on the pump shaft.

! **Make sure the Nilos rings are positioned properly!**

3 If possible, preheat the bearings to 90°C before mounting them on the pump shaft. The cylindrical bearing (2250) is to be mounted on the impeller side. The two angular contact bearings are mounted on the driving side **in O-arrangement**. Make sure all bearings are mounted straight on the pump shaft.

! **If preheating is not possible: never knock directly on the bearing! Use a mounting bush which is positioned against the inner raceway of the bearing and a normal hammer. A soft hammer may loose splinters which might damage the bearing.**

4 Mount the adjusting ring (2340) and mount the outer circlip (2360).

5 Grease the bearings. See paragraph 10.1 "Recommended greases" for recommended grease types.

6 Press the adjusting bush (2240) over the two angular contact bearings and place the inner circlip (2300) in the adjusting bush. Make sure the inner circlip falls into the groove.

7 Mount the shaft with the bearings into the bearing bracket from the motor side. Knock the shaft end on the coupling side until the first bearing (2250) slides through the bearing boring.

8 Carefully knock the shaft further into the bearing bracket until the adjusting bush (2240) is completely inside the bearing block. The shaft with the bearings should enter straight into the bearing bracket.

9 Mount the bearing cover (2110) and the splash ring (2220).

10 Mount the set screws (1930) and the Allen screws (2810) and adjust the axial play as described in paragraph 7.10 "Adjustment of the axial play".

11 Mount the self-priming part and the impeller as described in paragraph 7.8 "Shaft sealing" and paragraph 7.7.2 "Mounting the impeller".

7.10 Adjustment of the axial play

After repairs to the pump, the axial play of the pump wheel has to be adjusted. This play should be the same on both sides. To adjust the play proceed as follows, see figure 28:

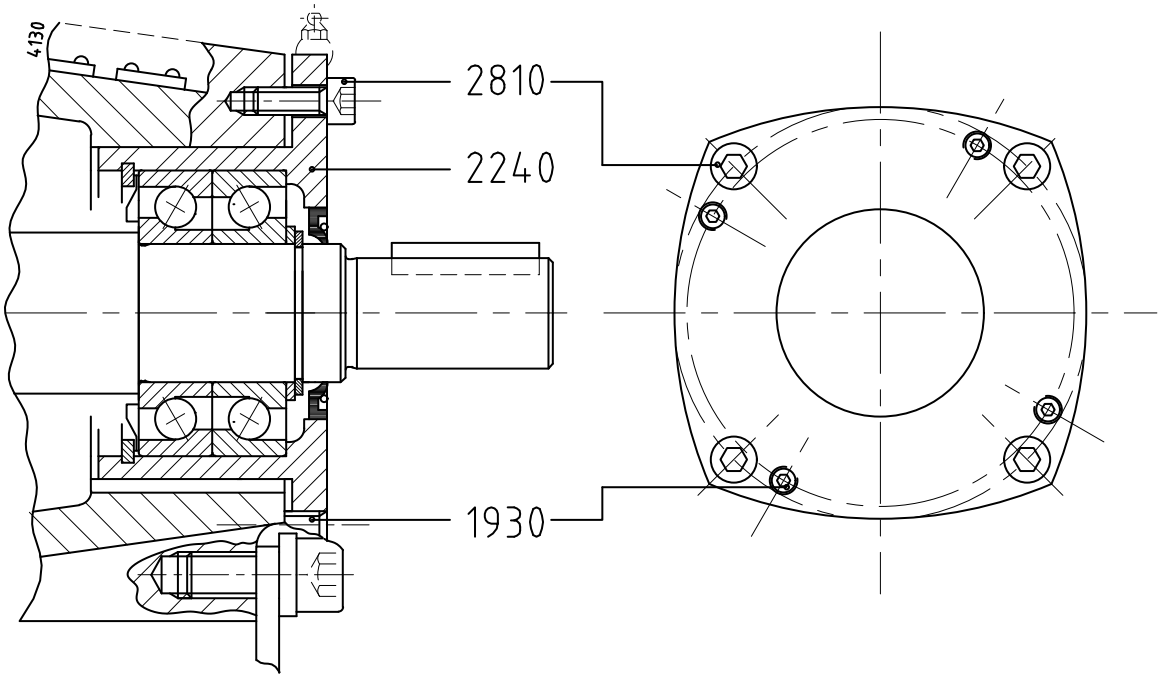


Figure 28: Adjustment of the axial play.

1 Loosen the set screws (1930).

2 Tighten the Allen screws (2810) crosswise. The adjusting bush (2240) with the bearing, pump shaft and pump wheel is shifting to the left. Turn the pump shaft by hand whilst tightening the screws. Tighten the Allen screws until you feel that the pump wheel starts to drag.

3 Screw the set screws (1930) sofar into the adjusting bush (2240) until they are just touching the bearing bracket.

4 Then loosen the Allen screws (2810) again.

5 Re-tighten the set screws (1930) crosswise, whilst turning the pump shaft by hand. Count the number of turns you can give the set screws until the pump wheel starts to turn.

6 Then loosen the set screws again by half of the number of tightening turns.

7 Now tighten the Allen screws (2810) properly, crosswise.

8 Verify that all 4 set screws are fixed tightly.

9 Verify that the pump shaft can be turned easily.

➢ *If you wish you can use a clock gauge instead of counting the number of tightening turns of the screws. Determine the position of the shaft end in the two extreme positions of the shaft. Then adjust the shaft end right in the middle of the measured values.*

8 Dimensions

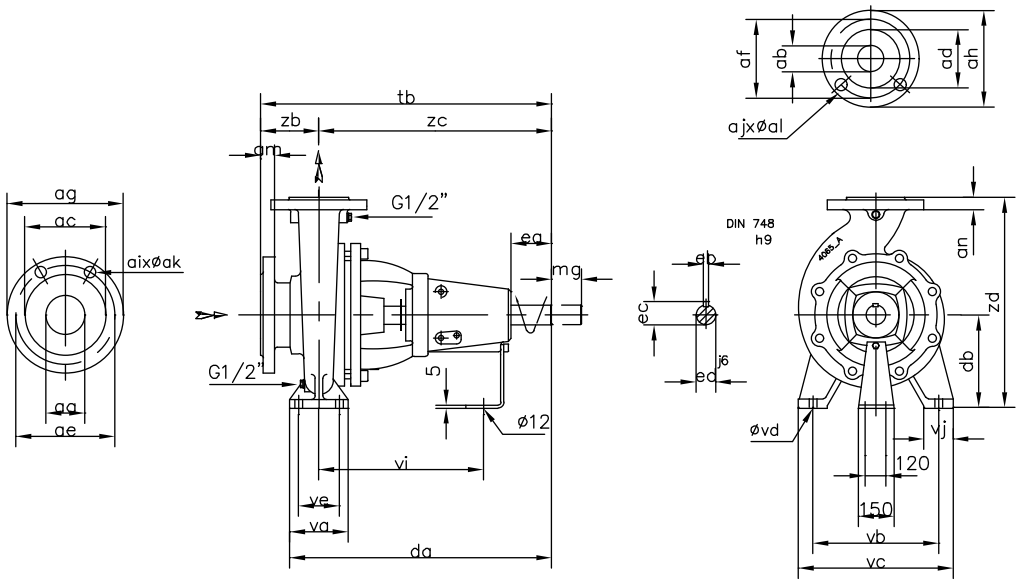


Figure 29: Pump dimensions.

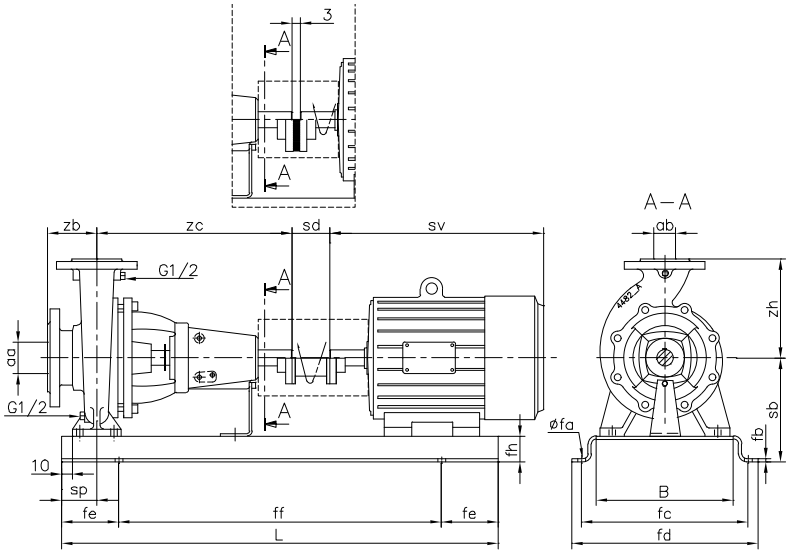


Figure 30: Dimensions pump + electric motor, with spacer-coupling or standard coupling (insert)

8.1 Dimensions pump

See figure 29

ISO 7005 PN16											
aa	**ab**	**ac**	**ad**	**ae**	**af**	**ag**	**ah**	**ai*ak**	**aj*al**	**am**	**an**
50	32	102	78	125	100	165	140	4*18	4*18	20	18
65	40	122	88	145	110	185	150	4*18	4*18	20	18
65	50	122	102	145	125	185	165	4*18	4*18	20	20
80	65	138	122	160	145	200	185	8*18	4*18	22	20
100	80	158	138	180	160	220	200	8*18	8*18	22	22
125	80	188	138	210	160	250	200	8*18	8*18	24	22
100	100	158	158	180	180	220	220	8*18	8*18	22	22
125	100	188	158	210	180	250	220	8*18	8*18	24	22
150	125	212	188	240	210	285	250	8*23	8*18	24	24

ISO 7005 ≅ EN 1092-2

ISO 7005 PN10											
aa	**ab**	**ac**	**ad**	**ae**	**af**	**ag**	**ah**	**ai*ak**	**aj*al**	**am**	**an**
200	150	268	212	295	240	340	285	8*23	8*23	26	24
200	200	268	268	295	295	340	340	8*23	8*23	26	26

ISO 7005 ≅ EN 1092-2

CH	aa	ab	da	db	ea	eb	ec	ed	mg	tb	va	vb	vc	vd	ve	vf	vi	vj	zb	zc	zd	[kg]
32-160	50	32	410	132	45	8	27	24	100	440	100	190	240	14	70	12	268	50	80	360	292	34
32-200	50	32	410	160	45	8	27	24	100	440	100	190	240	14	70	12	268	50	80	360	340	35
32-250	50	32	533	180	75	10	35	32	100	570	125	250	320	14	95	14	346	65	100	470	405	50
40-160	65	40	410	132	45	8	27	24	100	440	100	190	240	14	70	12	268	50	80	360	292	38
40-200	65	40	410	160	45	8	27	24	100	460	100	212	265	14	70	12	268	50	100	360	340	46
40-250	65	40	533	180	75	10	35	32	100	570	125	250	320	14	95	14	346	65	100	470	405	60
50-160	65	50	410	160	45	8	27	24	100	460	100	212	265	14	70	12	268	50	100	360	340	40
50-200	65	50	410	160	45	8	27	24	100	460	100	212	265	14	70	12	268	50	100	360	360	55
50-250	65	50	533	180	75	10	35	32	100	570	125	250	320	14	95	14	346	65	125	470	405	70
65-160	80	65	423	160	45	8	27	24	100	460	125	212	280	14	95	12	268	65	100	360	360	50
65-200	80	65	423	180	45	8	27	24	140	460	125	250	320	14	95	14	268	65	100	360	405	65
65-250	80	65	550	200	75	10	35	32	140	570	160	280	360	18	120	14	346	80	100	470	450	85
65-315	80	65	610	225	110	12	45	42	140	655	160	315	400	18	120	16	368	80	125	530	505	100
80-160	100	80	423	180	45	8	27	24	140	485	125	250	320	14	95	14	268	65	125	360	405	50
80-200	100	80	533	180	75	10	35	32	140	595	125	280	345	14	95	14	346	65	125	470	430	75
80-250	100	80	550	200	75	10	35	32	140	595	160	315	400	18	120	15	346	80	125	470	480	88
80-315	100	80	610	250	110	12	45	42	140	655	160	315	400	18	120	16	368	80	125	530	565	120
80-400	125	80	610	280	110	12	45	42	140	655	160	355	435	18	120	18	368	80	125	530	635	150
100-125	100	100	423	180	45	8	27	24	100	485	125	250	320	14	95	14	268	65	125	360	430	70
100-160	125	100	550	200	75	10	35	32	100	595	160	280	360	18	120	15	346	80	125	470	515	85
100-200	125	100	550	200	75	10	35	32	140	595	160	280	360	18	120	15	346	80	140	470	480	90
100-250	125	100	550	225	75	10	35	32	140	610	160	315	400	18	120	16	346	80	140	470	505	110
100-315	125	100	610	250	110	12	45	42	140	670	160	315	400	18	120	18	368	80	140	530	565	140
100-400	125	100	630	280	110	12	45	42	140	670	200	400	500	23	150	20	368	100	140	530	635	185
125-250	150	125	550	250	75	10	35	32	140	610	160	315	400	18	120	18	346	80	140	470	605	130
125-315	150	125	630	280	110	12	45	42	140	670	200	400	500	23	150	20	368	100	140	530	635	185
125-400	150	125	630	315	110	12	45	42	140	670	200	400	500	23	150	20	368	100	140	530	715	200
150-315	200	150	630	280	110	12	45	42	140	690	200	450	550	23	150	22	368	100	160	530	680	185
150-400	200	150	630	315	110	12	45	42	140	690	200	450	550	23	150	22	368	100	160	530	765	220
200-200	200	200	570	280	75	10	35	32	100	670	200	400	500	23	150	20	346	100	200	470	680	170

8.2 Dimensions pump and motor with standard coupling

See figure 30.

Type CH								IEC motor																
								90	90	100	112	132	132	160	160	180	180	200	225	225	250	280	280
								S	L	L	M	S	M	M	L	M	L	L	S	M	M	S	M
								sv(*)															
	aa	ab	sp	zb	zc	zh		336	348	402	432	486	520	652	672	712	742	790	904	904	1014	1124	1176
32-160	50	32	60	80	360	160	sb	177	177	177	177	177											
							x	1	1	1	1	1											
32-200	50	32	60	80	360	180	sb			205	205	205		223									
							x			1	1	1		2									
32-250	50	32	72	100	470	225	sb			243	243	243		260	260								
							x			2	2	2		3	3								
40-160	65	40	60	80	360	160	sb		177	177	177	177		223									
							x		1	1	1	1		2									
40-200	65	40	60	100	360	180	sb				205	205		223	223								
							x				1	1		2	2								
40-250	65	40	72	100	470	225	sb			243	243	243		260	260	260							
							x			2	2	2		3	3	3							
50-160	65	50	60	100	360	180	sb		205	205	205	205		223									
							x		1	1	1	1		2									
50-200	65	50	60	100	360	200	sb			205	205	205		223	223	260		290					
							x			1	1	1		2	2	3		4					
50-250	65	50	72	100	470	225	sb			243	243	243	243	260	260	260		290					
							x			2	2	2	2	3	3	3		4					
65-160	80	65	72	100	360	200	sb					205		223	223	260		290					
							x					1		2	2	3		4					
65-200	80	65	72	100	360	225	sb					243		243	243	260		290					
							x					2		2	2	3		4					
65-250	80	65	90	100	470	250	sb			280	280	280	280	280	280	280		290		315			
							x			3	3	3	3	3	3	3		4		4			
65-315	80	65	90	125	530	280	sb				315	315	315	315	315	315							
							x				4	4	4	4	4	4							
80-160	100	80	72	125	360	225	sb					243		243	243	260		290					
							x					2		2	2	3		4					
80-200	100	80	72	125	470	250	sb					260		260	260	260		290		315	380	410	
							x					3		3	3	3		4		4	6	6	
80-250	100	80	72	125	470	280	sb				290	290	290	290	290	290		290		315	380	410	
							x				4	4	4	4	4	4		4		4	6	6	
80-315	100	80	90	125	530	315	sb				340	340	340	340	340	340	340	340					
							x				4	4	4	4	4	4	4	4					
80-400	125	80	90	125	530	355	sb						370	370	370	370	370	370					
							x						4	4	4	4	4	4					
100-125	100	100	72	125	360	250	sb					243		243	243	260		290					
							x					2		2	2	3		4					
100-160	125	100	90	125	470	315	sb							280	280	280		290		315	380		
							x							3	3	3		4		4	6		
100-200	125	100	90	125	470	280	sb								280	280		290		315	380	410	
							x								3	3		4		4	6	6	
100-250	125	100	90	140	470	280	sb				315	315	315	315	315	315		315		315	380	410	410
							x				4	4	4	4	4	4		4		4	6	6	6

Type CH								IEC motor																
								90	90	100	112	132	132	160	160	180	180	200	225	225	250	280	280
								S	L	L	M	S	M	M	L	M	L	L	S	M	M	S	M
								sv(*)															
	aa	ab	sp	zb	zc	zh		336	348	402	432	486	520	652	672	712	742	790	904	904	1014	1124	1176
100-315	125	100	90	140	530	315	sb					340	340	340	340	340	340	340					
							x					4	4	4	4	4	4	4					
100-400	125	100	110	140	530	355	sb					370	370	370	370	370	370	370	410	410	410		
							x					4	4	4	4	4	4	4	6	6	6		
125-250	150	125	90	140	470	355	sb					340	340	340	340	340	340	340					
							x					4	4	4	4	4	4	4					
125-315	150	125	110	140	530	355	sb						370	370	370	370	370	370	410	410	410		
							x						4	4	4	4	4	4	6	6	6		
125-400	150	125	110	140	530	400	sb						405	405	405	405	405	405	445	445	445	445	445
							x						4	4	4	4	4	4	6	6	6	6	6
150-315	200	150	110	160	530	400	sb							410	410	410	410	410	410	410	410	410	410
							x							6	6	6	6	6	6	6	6	6	6
150-400	200	150	110	160	530	450	sb								445	445	445	445	445	445	445	445	445
							x								6	6	6	6	6	6	6	6	6
200-200	200	200	110	200	470	400	sb								370	370	370	370					
							x								4	4	4	4					

x = Base plate number

(*) Motor length based on DIN 42673, could be different due to applied motor make

8.3 Dimensions pump and motor with spacer coupling

See figure 30.

Type CH								IEC motor																
								90	90	100	112	132	132	160	160	180	180	200	225	225	250	280	280
								S	L	L	M	S	M	M	L	M	L	L	S	M	M	S	M
								sv(*)															
	aa	ab	sp	zb	zc	zh		336	348	402	432	486	520	652	672	712	742	790	904	904	1014	1124	1176
32-160	50	32	60	80	360	160	sb	177	177	195	195	195											
							x	1	1	2	2	2											
32-200	50	32	60	80	360	180	sb			223	223	223		223									
							x			2	2	2		2									
32-250	50	32	72	100	470	225	sb			243	243	243		260	260								
							x			2	2	2		3	3								
40-160	65	40	60	80	360	160	sb		177	195	195	195		223									
							x		1	2	2	2		2									
40-200	65	40	60	100	360	180	sb				223	223		223	240								
							x				2	2		2	3								
40-250	65	40	72	100	470	225	sb			243	243	243		260	260	260							
							x			2	2	2		3	3	3							
50-160	65	50	60	100	360	180	sb		205	223	223	223		223									
							x		1	2	2	2		2									
50-200	65	50	60	100	360	200	sb			223	223	223		223	240	260		290					
							x			2	2	2		2	3	3		4					
50-250	65	50	72	100	470	225	sb			243	243	243	260	260	260	260		290					
							x			2	2	2	3	3	3	3		4					
65-160	80	65	72	100	360	200	sb					223		240	240	260		290					
							x					2		3	3	3		4					
65-200	80	65	72	100	360	225	sb					243		260	260	260		290					
							x					2		3	3	3		4					
65-250	80	65	90	100	470	250	sb			280	280	280	280	280	280	280		300		325			
							x			3	3	3	3	3	3	3		5		5			
65-315	80	65	90	125	530	280	sb				315	315	315	315	325	325							
							x				4	4	4	4	5	5							
80-160	100	80	72	125	360	225	sb					243		260	260	260		290					
							x					2		3	3	3		4					
80-200	100	80	72	125	470	250	sb					260		260	260	260		300		325	380	410	
							x					3		3	3	3		5		5	6	6	
80-250	100	80	72	125	470	280	sb				290	290	290	290	290	290		300		325	380	410	
							x				4	4	4	4	4	4		5		5	6	6	
80-315	100	80	90	125	530	315	sb				340	340	340	340	350	350	350	350					
							x				4	4	4	4	5	5	5	5					
80-400	125	80	90	125	530	355	sb						370	370	380	380	380	380					
							x						4	4	5	5	5	5					
100-125	100	100	72	125	360	250	sb					243		260	260	260		290					
							x					2		3	3	3		4					
100-160	125	100	90	125	470	315	sb							280	280	280		300		325	380		
							x							3	3	3		5		5	6		
100-200	125	100	90	125	470	280	sb								280	280		300		325	380	410	
							x								3	3		5		5	6	6	
100-250	125	100	90	140	470	280	sb				315	315	315	315	315	315		325		325	380	410	410
							x				4	4	4	4	4	4		5		5	6	6	6

Type CH								IEC motor															
								90	90	100	112	132	132	160	160	180	180	200	225	225	250	280	280
								S	L	L	M	S	M	M	L	M	L	L	S	M	M	S	M
								sv(*)															
	aa	ab	sp	zb	zc	zh		336	348	402	432	486	520	652	672	712	742	790	904	904	1014	1124	1176
100-315	125	100	90	140	530	315	sb					340	340	340	350	350	350	350					
							x					4	4	4	5	5	5	5					
100-400	125	100	110	140	530	355	sb					370	370	410	410	410	410	410	410	410	410		
							x					4	4	6	6	6	6	6	6	6	6		
125-250	150	125	90	140	470	355	sb					340	340	340	340	340	350	350					
							x					4	4	4	4	4	5	5					
125-315	150	125	110	140	530	355	sb						370	410	410	410	410	410	410	410	410		
							x						4	6	6	6	6	6	6	6	6		
125-400	150	125	110	140	530	400	sb						405	445	445	445	445	445	445	445	445	445	445
							x						4	6	6	6	6	6	6	6	6	6	6
150-315	200	150	110	160	530	400	sb							410	410	410	410	410	410	410	410	410	410
							x							6	6	6	6	6	6	6	6	6	6
150-400	200	150	110	160	530	450	sb								445	445	445	445	445	445	445	445	445
							x								6	6	6	6	6	6	6	6	6
200-200	200	200	110	200	470	400	sb								370	410	410	410					
							x								4	6	6	6					

x = Base plate number

(*) Motor length based on DIN 42673, could be different due to applied motor make

8.4 Dimensions base plate

Base plate number	[mm]									Weight
	L	B	fa	fb	fc	fd	fe	ff	fh	[kg]
1	800	305	19	6	385	433	120	560	45	20
2	1000	335	19	8	425	473	145	710	63	38
3	1250	375	24	10	485	545	175	900	80	69
4	1250	500	24	10	610	678	175	900	90	79
5	1600	480	24	10	590	658	240	1120	100	107
6	1650	600	24	10	720	788	240	1170	130	129

8.5 Dimensions pump with service liquid tank

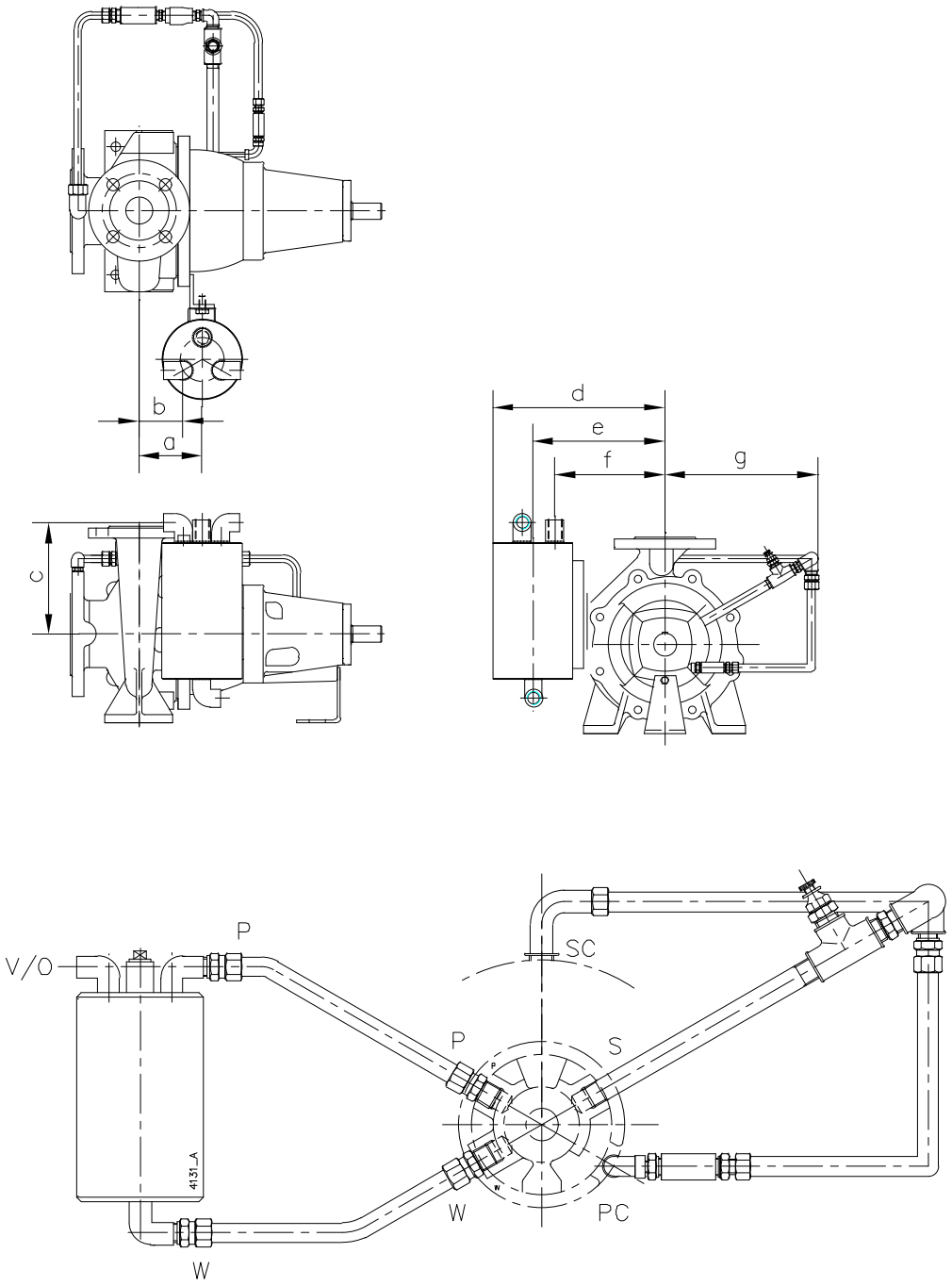


Figure 31: Dimensions pump with service liquid tank.

CH	a	b	c	d	e	f	g*	g**
32-160	94	66	165	275	215	183	200	
32-200	94	66	155	300	240	208	200	
32-250	109	81	165	330	270	238	200	235
40-160	94	66	165	275	215	183	200	
40-200	94	66	155	300	240	208	200	
40-250	109	81	165	330	270	238	200	235
50-160	94	66	165	275	215	183	200	
50-200	94	66	155	300	240	208	200	
50-250	109	81	165	330	270	238	200	235
65-160	94	66	165	275	215	183	200	
65-200	94	66	155	300	240	208	200	
65-250	109	81	165	330	270	238	200	235
65-315	140	112	130	345	285	253		305
80-160	94	66	165	275	215	183	200	
80-200	109	81	155	300	240	208	200	
80-250	109	81	165	330	270	238	200	235
80-315	140	112	130	345	285	253		305
80-400	132	104	130	395	335	303		305
100-125	94	66	165	275	215	183	200	
100-160	109	81	155	300	240	208	200	
100-200	109	81	155	300	240	208	200	
100-250	109	81	165	330	270	238	200	235
100-315	140	112	130	345	285	253		305
100-400	132	104	130	395	335	303		305
125-250	109	81	165	330	270	238		305
125-315	140	112	130	345	285	253		305
125-400	132	104	130	395	335	303		305
150-315	140	112	130	345	285	253		305
150-400	132	104	130	395	335	303		305
200-200	109	81	165	330	270	238		305

* n = 2400 - 3600 min^{-1}

** n = 1450 - 2400 min^{-1}

Connections

V/O	De-aeration / Overflow	Rp½
S	Inlet self-priming pump	Rp½
SP	Air-intake line	Rp½
P	Outlet self-priming pump	Rp½
W	Inlet service liquid	Rp½
SC	Suction flange connection	Rp½

8.6 Dimensions pump with float de-aerator

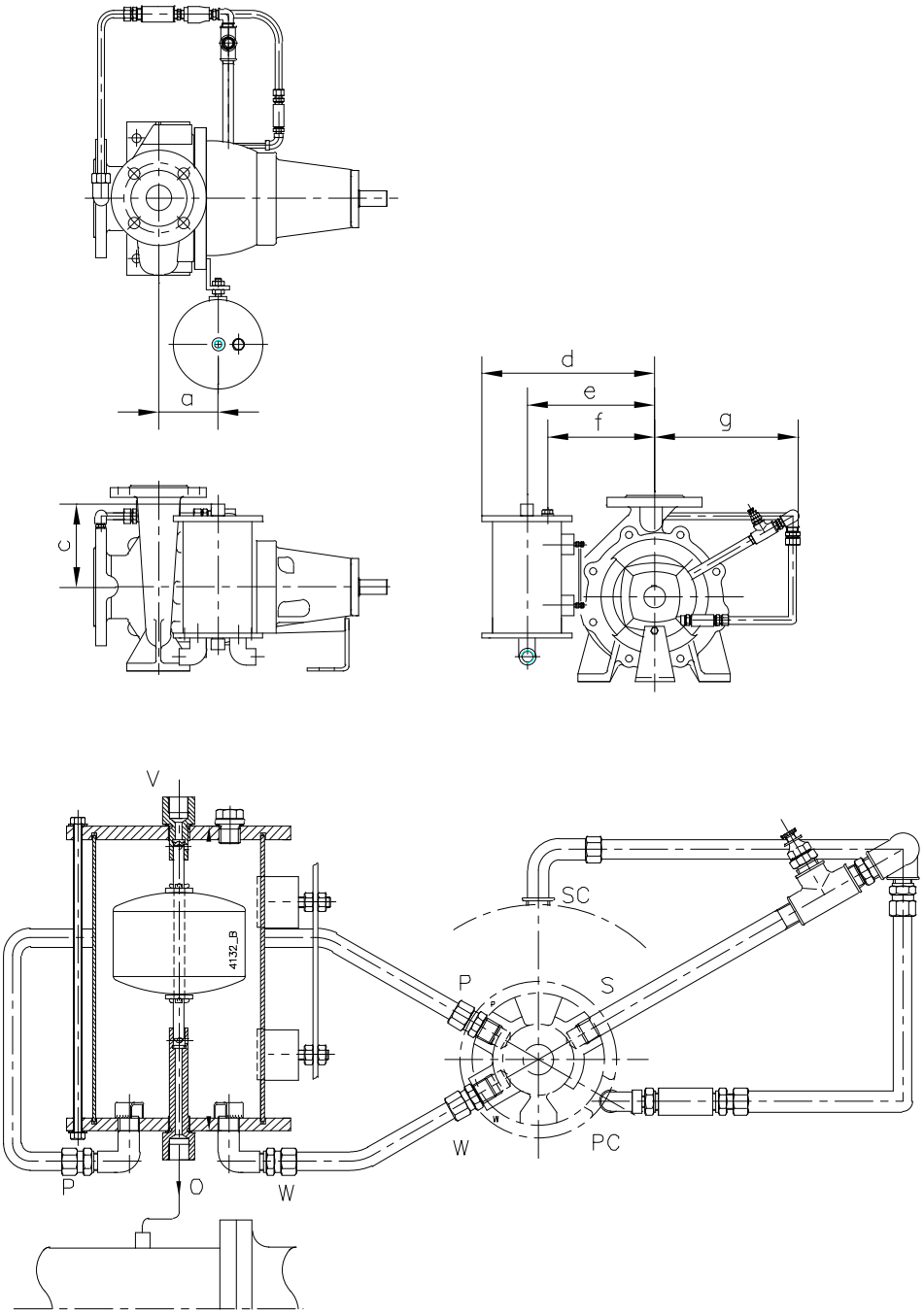


Figure 32: Dimensions pump with float de-aerator.

CH	a	c	d	e	f	g*	g**
32-160	94	243	378	268	268	200	-
32-200	94	233	402	292	292	200	-
32-250	109	243	432	322	322	200	235
40-160	94	243	378	268	268	200	-
40-200	94	233	402	292	292	200	-
40-250	109	243	432	322	322	200	235
50-160	94	243	378	268	268	200	-
50-200	94	233	402	292	292	200	-
50-250	109	243	432	322	322	200	235
65-160	94	243	378	268	268	200	-
65-200	94	233	402	292	292	200	-
65-250	109	243	432	322	322	200	235
65-315	140	209	447	337	337	-	305
80-160	94	243	378	268	268	200	-
80-200	109	233	402	292	292	200	-
80-250	109	243	432	322	322	200	235
80-315	140	209	447	337	337	-	305
80-400	132	209	449	389	389	-	305
100-125	94	243	378	268	268	200	-
100-160	109	233	402	292	292	200	-
100-200	109	233	402	292	292	200	-
100-250	109	243	432	322	322	200	235
100-315	140	209	447	337	337	-	305
100-400	132	209	449	389	289	-	305
125-250	109	243	432	322	322	-	305
125-315	140	209	447	337	337	-	305
125-400	132	209	449	389	389	-	305
150-315	140	209	447	337	337	-	305
150-400	132	209	449	389	389	-	305
200-200	109	243	432	322	322	-	305

* n = 2400 - 3600 min^{-1}

** n = 1450 - 2400 min^{-1}

Connections

V	De-aeration	Rp½
O	Waste water drain	Rp½
S	Inlet self-priming pump	Rp½
SP	Air-intake line	Rp½
P	Outlet self-priming pump	Rp½
W	Inlet service liquid	Rp½
SC	Suction flange connection	Rp½

9 Parts

9.1 Ordering parts

9.1.1 Order form

You can use the order form included in this manual for ordering parts.

When ordering parts always quote the following data:

1 Your **address**.

2 The **quantity, the item number and the description** of the part.

3 The **pump number**. The pump number is stated on the label on the cover of this manual and on the type plate of the pump.

4 In the event of different electric motor voltage you should state the correct voltage.

9.1.2 Recommended spare parts

Parts marked with a * are recommended spare parts.

9.2 Pump parts

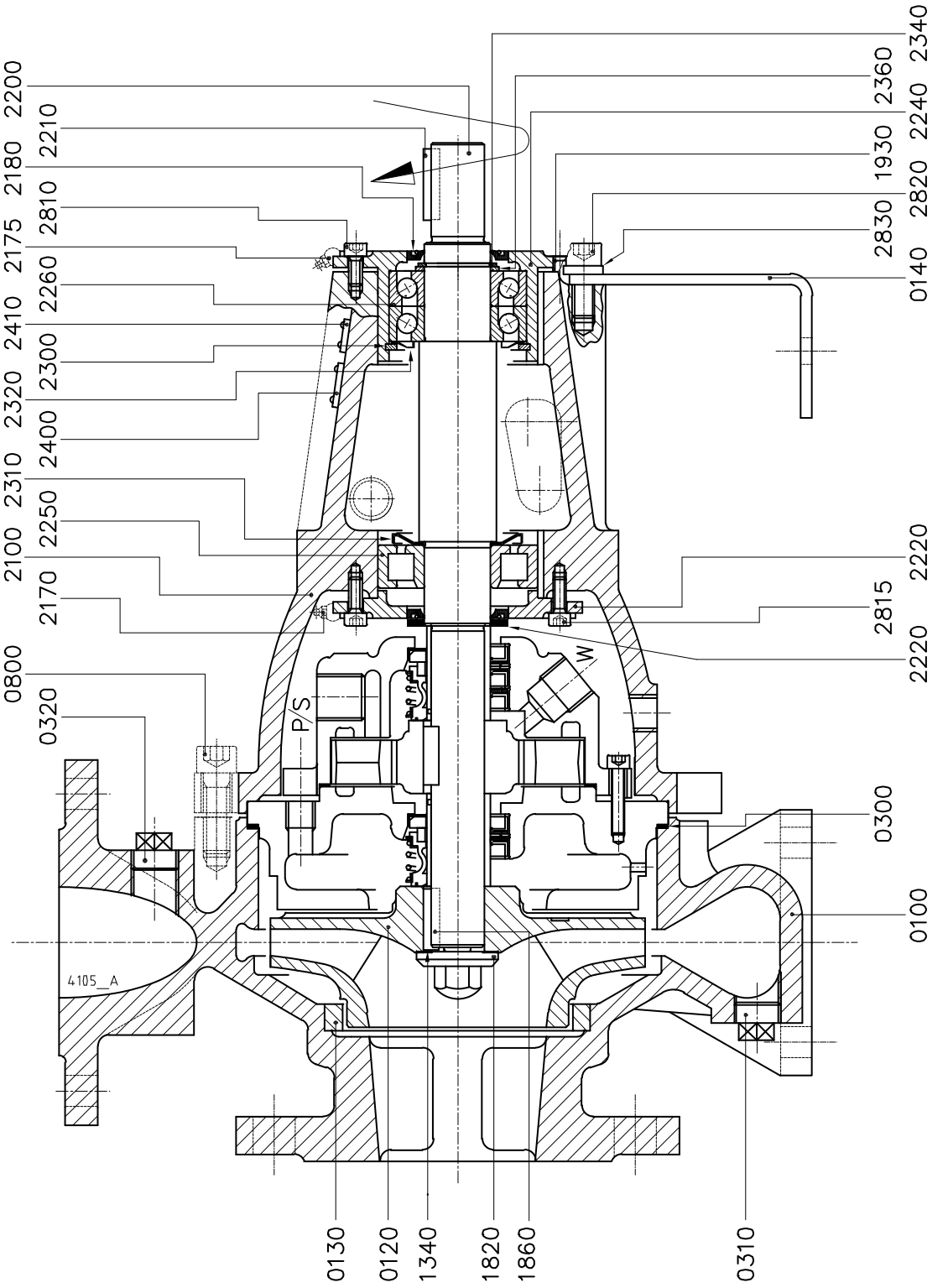


Figure 33: CombiPrime H.

Item	Quantity	Description	Material				
			G1	G2	G3	B2	B3
0100	1	pump casing	cast iron			bronze	
0120*	1	impeller	cast iron	bronze	aluminium bronze	bronze	aluminium bronze
0130*	1	wear ring [1)]	cast iron	bronze			
0140	1	bracket support	steel				
0300*	1	gasket	--				
0310	1	plug	cast iron			bronze	
0320	1	plug	cast iron			bronze	
0800	**	Allen screw	steel			stainless steel	
1340*	1	gasket	--				
1820*	1	cap nut	stainless steel				
1860*	1	impeller key	stainless steel				
1930	4	set screw	stainless steel				
2100	1	bearing bracket	cast iron				
2110	1	bearing cover	cast iron				
2170	1	grease nipple	steel				
2175	1	grease nipple	steel				
2180	2	oil baffle	NBR/spring steel				
2200*	1	pump shaft	steel alloy			stainless steel	
2210*	1	coupling key	steel				
2220*	1	deflector	rubber				
2240*	1	adjusting bush	cast iron				
2250*	1	cylindrical roller bearings	-				
2260*	2	angular contact ball bearing	-				
2300*	1	inner circlip	spring steel				
2310*	1	Nilos ring	steel				
2320	1	Nilos ring	steel				
2340	1	adjusting ring	steel				
2360*	1	outer circlip	spring steel				
2400	1	name plate	stainless steel				
2410	1	arrow plate	aluminium				
2810	4	Allen screw	steel				
2815	4	Allen screw	steel				
2820	1	Allen screw	steel				
2830	1	washer	steel				

** Number dependent on pump type 8 or 12

[1)] Item 0130 not for the pump types of bearing bracket 1 and for 40-250 and 50-250

9.3 Parts of shaft sealing group M2

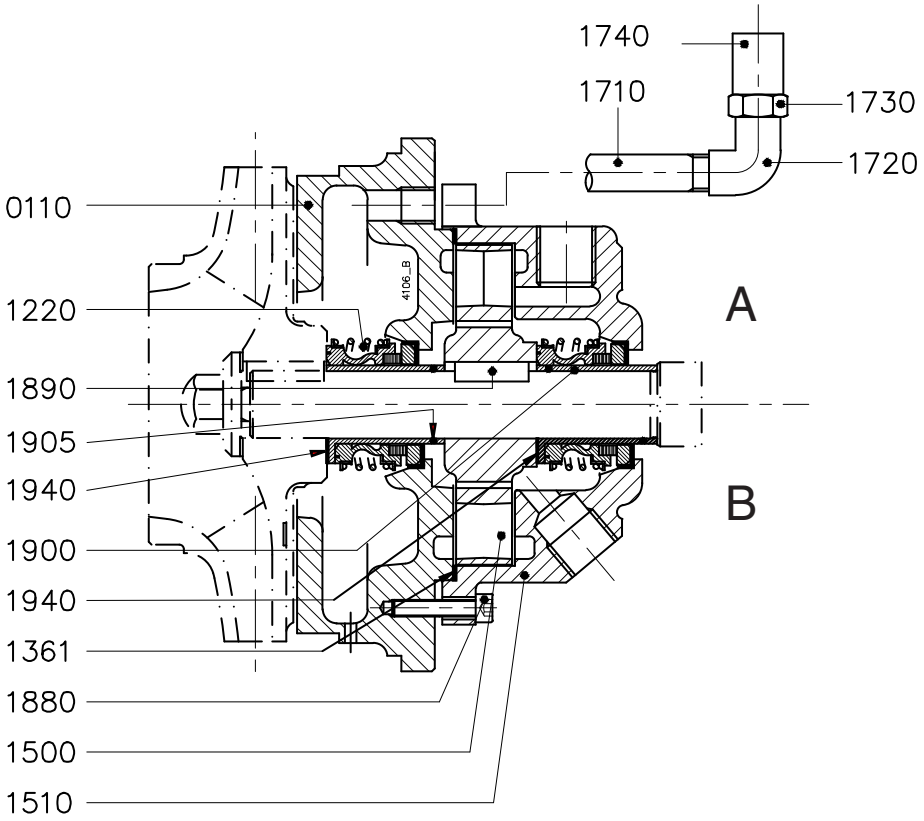


Figure 34: Parts of shaft sealing group M2
(A = bearing group 1 and 2, B = bearing group 3).

Item	Quantity	Description	Material				
			G1	G2	G3	B2	B3
0110	1	pump cover	cast iron			bronze	
1220*	2	mechanical seal	--				
1361*	1	gasket	--				
1500*	1	air-wheel	bronze				
1510	1	self-priming casing	cast iron			bronze	
1710	1	pipe nipple [1)]	steel			stainless steel	
1720	1	elbow [1)]	ductile cast iron			stainless steel	
1730	1	reducing nipple [1)]	stainless steel				
1740	1	socket [1)]	steel			stainless steel	
1880	8	Allen screw	steel			stainless steel	
1890	1	key	stainless steel				
1900*	2	shaft sleeve	stainless steel				
1905*	2	O-ring	viton				
1940**	2	gasket	--				

[1)] Items 1710, 1720, 1730 and 1740 only for the pump types with a nominal impeller diameter of 160 and 250 mm (n = 1500 / 1800 min^{-1})

** only for bearing bracket group 3

9.4 Parts of shaft sealing group M4

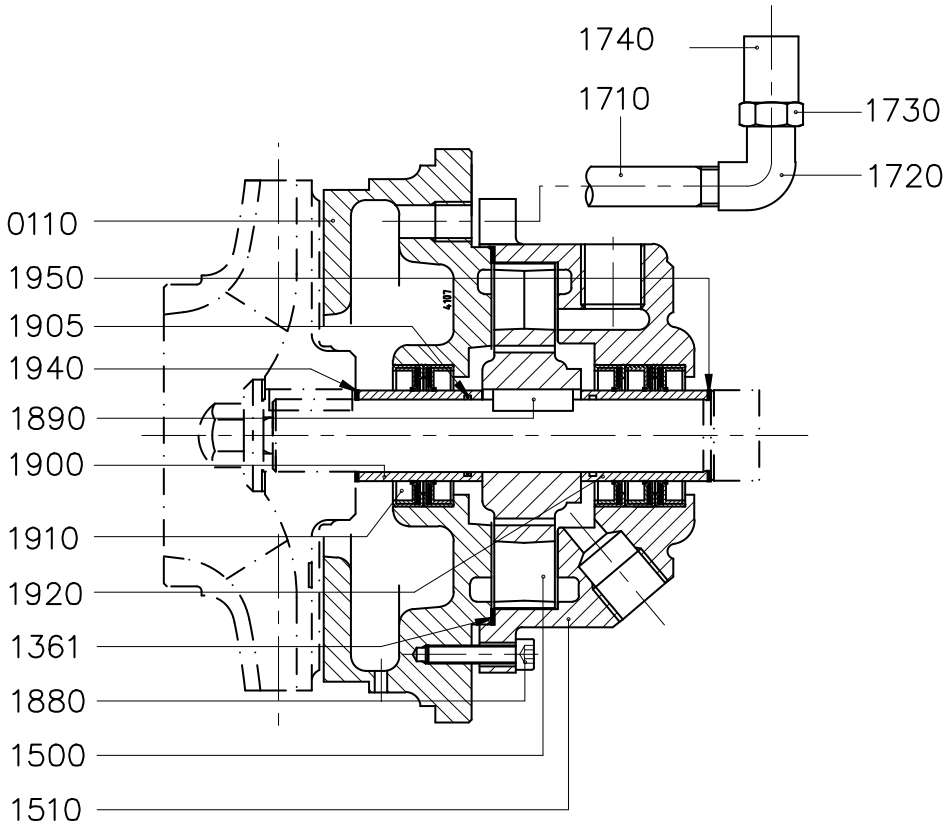


Figure 35: Parts of shaft sealing group M4.

Item	Quantity	Description	Material				
			G1	G2	G3	B2	B3
0110	1	pump cover	cast iron			bronze	
1361*	1	gasket	--				
1500*	1	air-wheel	bronze				
1510	1	self-priming casing	cast iron			bronze	
1710	1	pipe nipple [1)]	steel			stainless steel	
1720	1	elbow [1)]	ductile cast iron			stainless steel	
1730	1	reducing nipple [1)]	stainless steel				
1740	1	socket [1)]	steel			stainless steel	
1880	5	Allen screw	steel			stainless steel	
1890	1	key	stainless steel				
1900*	1	shaft sleeve	stainless steel with wearing layer				
1905*	1	O-ring	viton				
1910*	5	lip seal	PTFE				
1920*	1	shaft sleeve	stainless steel with wearing layer				
1940*	1	gasket	--				
1950*	1	gasket	--				

[1)] Items 1710, 1720, 1730 and 1740 only for the pump types with a nominal impeller diameter of 160 and 250 mm (n = 1500 / 1800 min^{-1})

9.5 Parts of service liquid tank TL

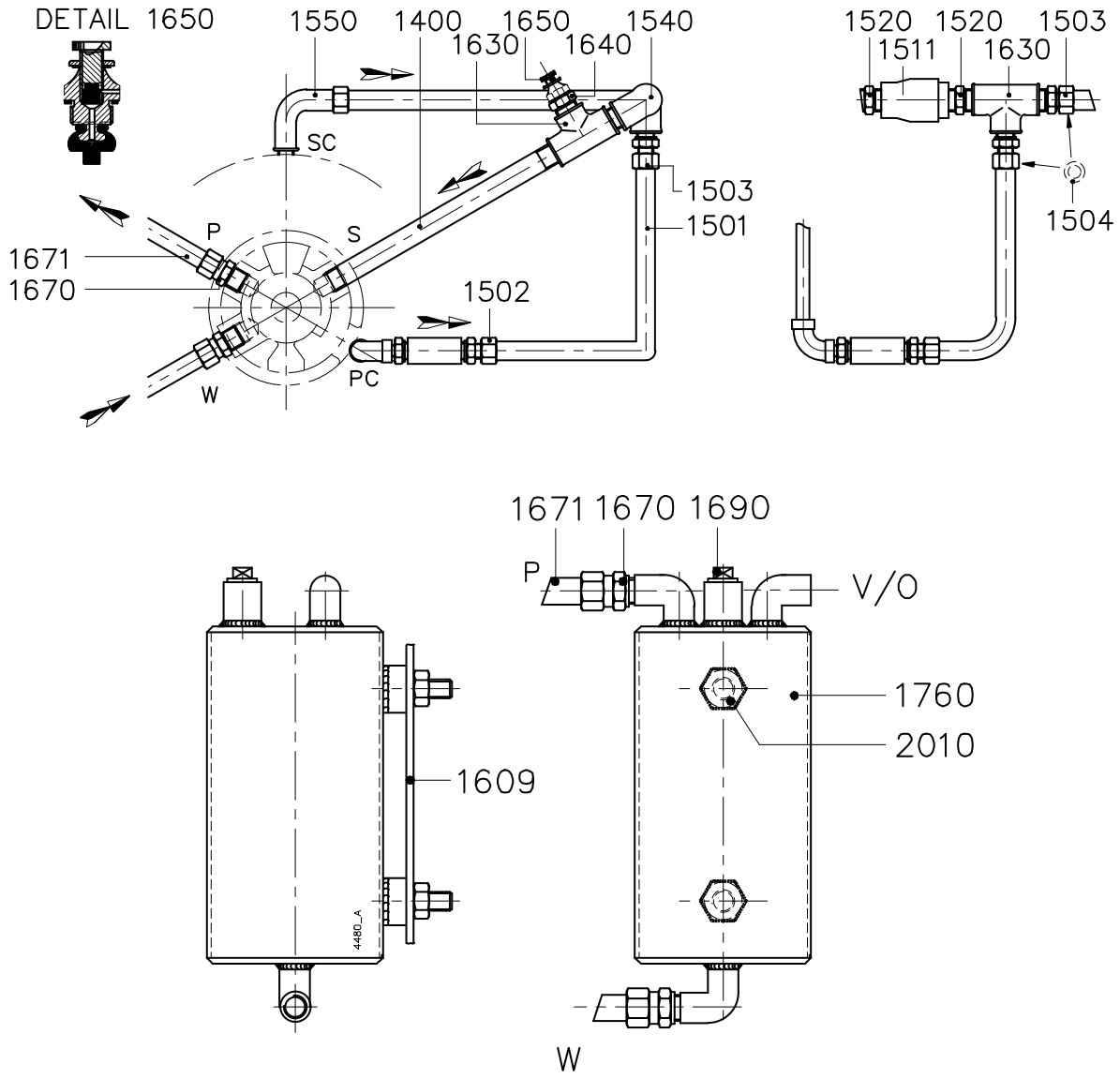


Figure 36: Parts of service liquid tank TL.

Item	Quantity	Description	Material				
			G1	G2	G3	B2	B3
1400	1	pipe nipple	stainless steel				
1501	1	pipe	stainless steel				
1502	1	male connector	stainless steel				
1503	2	male connector	steel			stainless steel	
1504*	2	orifice	stainless steel				
1511	1	non-return valve	NBR/brass			stainless steel	
1520	2	double nipple	ductile iron			stainless steel	
1540	1	elbow	steel			stainless steel	
1550	1	elbow	steel			stainless steel	
1609	1	tank support	steel				
1630	2	tee	ductile iron			stainless steel	
1640	1	reducing ring	ductile iron			stainless steel	
1650	1	air inlet valve	brass				
1670	4	male connector	steel			stainless steel	
1671	1	pipe	stainless steel				
1690	1	plug	ductile iron			bronze	
1760	1	tank	stainless steel				
2010	2	nut	steel			stainless steel	

* If the delivery head is over 30 m throttling is applied in order to create a vacuum behind the air inlet valve.

9.6 Parts of float de-aerator VL

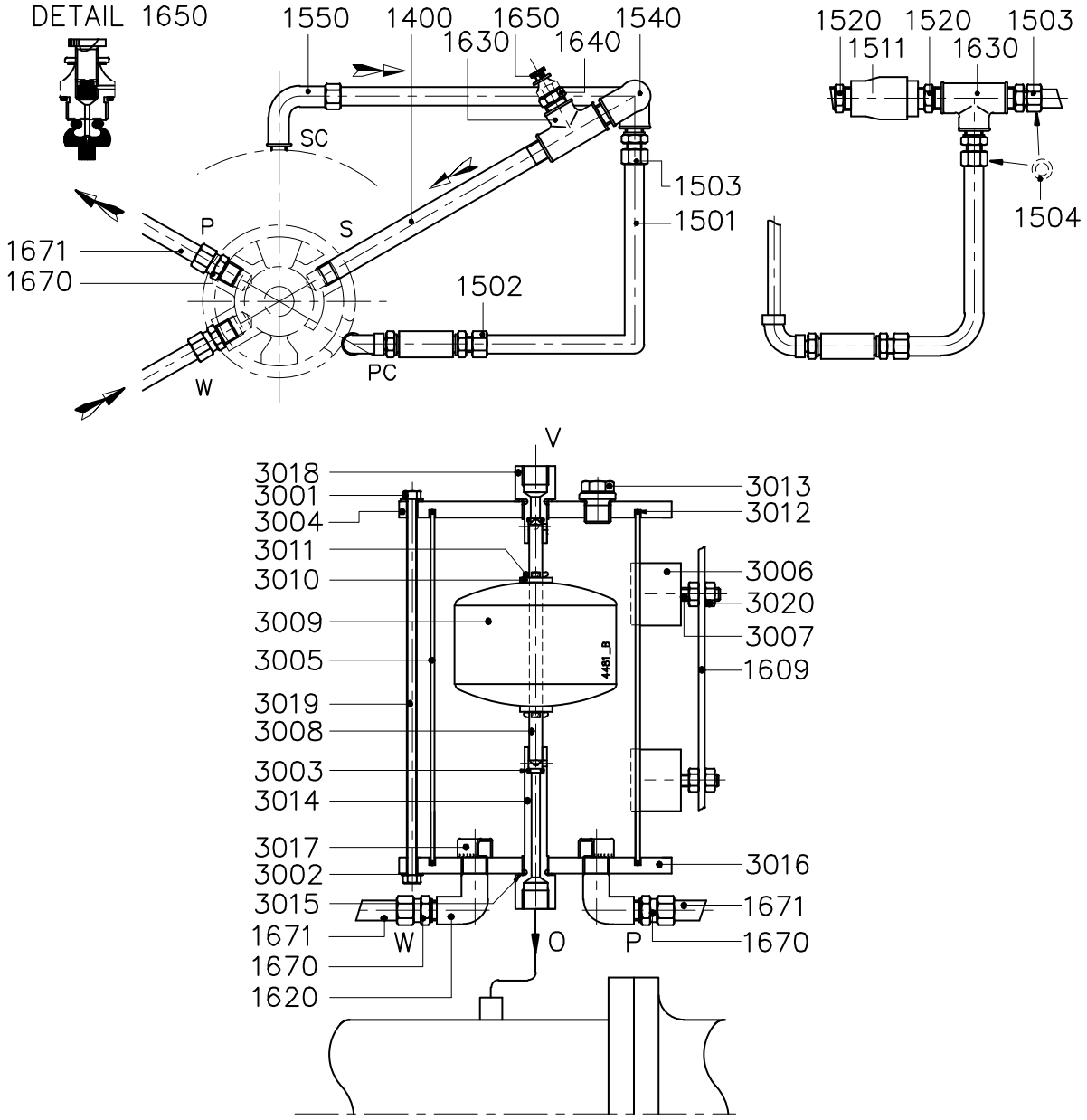


Figure 37: Parts of float de-aerator VL.

Item	Quantity	Description	Material				
			G1	G2	G3	B2	B3
1400	1	pipe nipple	stainless steel				
1501	1	pipe	stainless steel				
1502	1	male connector	stainless steel				
1503	2	male connector	steel			stainless steel	
1504**	2	orifice	stainless steel				
1511	1	non-return valve	NBR/brass			stainless steel	
1520	2	double nipple	ductile iron			stainless steel	
1540	1	elbow	steel			stainless steel	
1550	1	elbow connector	steel			stainless steel	
1609	1	tank support	steel				
1630	2	T-piece	ductile iron			stainless steel	
1640	1	reducing ring	ductile iron			stainless steel	
1650	1	air-inlet valve	brass				
1670	4	male connector	steel			stainless steel	
1671	1	pipe	stainless steel				
2010	2	nut	steel			stainless steel	
3001	8	nut	stainless steel				
3002	8	washer	stainless steel				
3003*	2	O-ring	NBR				
3004	1	cover	stainless steel				
3005	1	jacket	stainless steel				
3006	2	bow	stainless steel				
3007	2	bolt	stainless steel				
3008*	1	float needle	POM				
3009*	1	float	stainless steel				
3010*	2	washer	stainless steel				
3011*	2	split pin	stainless steel				
3012*	2	O-ring	Viton				
3013	1	plug	stainless steel				
3014	1	long valve seat	stainless steel				
3015	3	sealing ring	gylon				
3016	1	bottom	stainless steel				
3017	2	bow	stainless steel				
3018	1	short valve seat	stainless steel				
3019	4	tie rod	stainless steel				
3020	4	nut	stainless steel				

** If the delivery head is over 30 m throttling is applied in order to create a vacuum behind the air inlet valve.

10 Technical data

10.1 Recommended greases

Recommended greases according to classification NLGI-2.

BP	Energrease LS-EP 2
CHEVRON	Black Pearl Grease EP 2
CHEVRON	MultifaK EP-2
EXXONMOBIL	Beacon EP 2 (Moly)
EXXONMOBIL	Mobilux EP 2 (Moly)
SHELL	Alvania RL2
SKF	LGMT 2
TOTAL	Total Lical EP 2
Quantity/bearing [gr] = 0,005 * Outer diameter [mm] * bearing width [mm]	

10.2 Recommended locking liquids

Description	Locking liquid
cap nut (1820)	Loctite 243
wear ring (0130)	Loctite 641

10.3 Tightening moments

10.3.1 Tightening moments for bolts and nuts

Materials	8.8	A2, A4
Thread	Tightening moment [Nm]	
M6	9	6
M8	20	14
M10	40	25
M12	69	43
M16	168	105

10.3.2 Tightening moments for cap nut

Size	Tightening moment [Nm]
M12 (bearing group 1)	43
M16 (bearing group 2)	105
M24 (bearing group 3)	220

10.4 Permissible forces and moments on the flanges

Forces and moments acting on the pump flanges due to pipe loads can cause misalignment of the pump and driver shafts, deformation and overstressing of the pump casing, or overstressing of the fixing bolts between the pump and the base plate.

The maximum allowable forces and moments on the flanges should be based on the following maximum values for the lateral displacement of the shaft end, relative to the fixed point in space:

- pumps of bearing group 1: 0,15 mm,
- pumps of bearing group 2: 0,20 mm,
- pumps of bearing group 3: 0,25 mm,

The values can be applied simultaneously in all directions with positive or negative signs, or separately on each flange (suction and discharge).

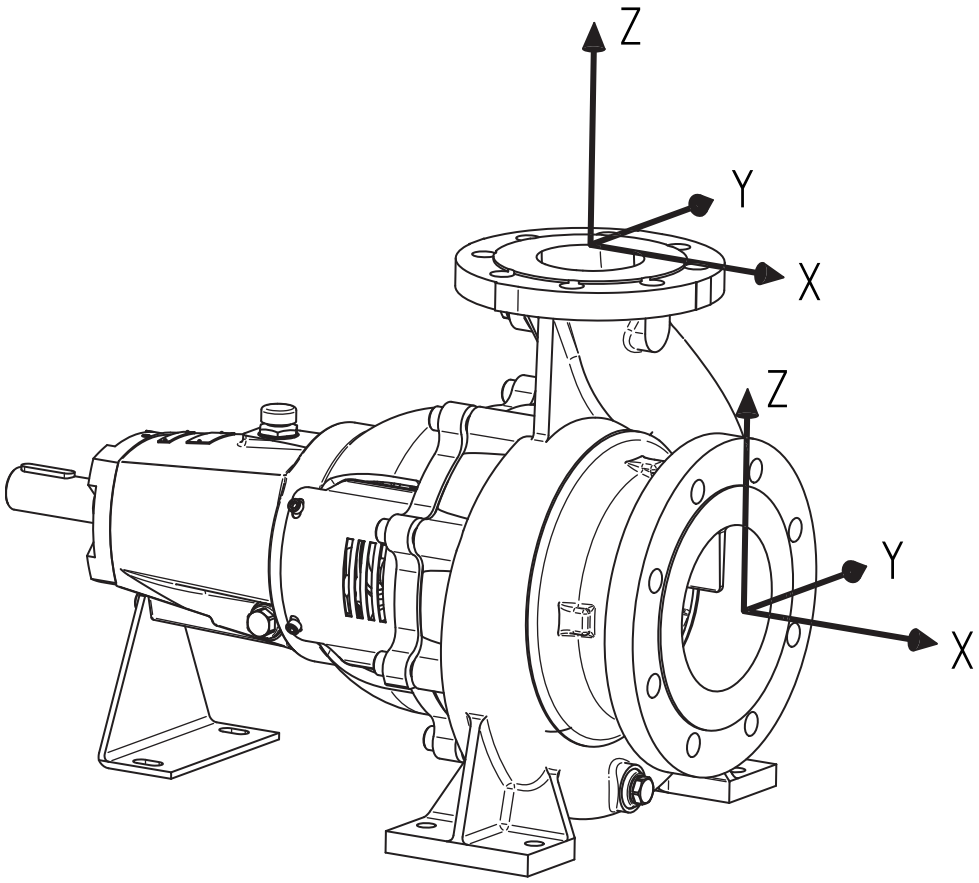


Figure 38: Coordinate system.

Table 5: Permissible forces and moments on the flanges, based on EN-ISO 5199

CH	Pump unit with a non-grouted base plate															
	Horizontal Pump, End branch, x-Axis								Horizontal Pump, Top branch, z-Axis							
	Force [N]				Moment [N.m]				Force [N]				Moment [N.m]			
	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
32-160	525	472	578	910	350	403	490	718	298	368	315	578	263	298	385	560
32-200	525	472	578	910	350	403	490	718	298	368	315	578	263	298	385	560
32-250	525	472	578	910	350	403	490	718	298	368	315	578	263	298	385	560
40-160	648	595	735	1155	385	420	525	770	350	438	385	683	315	368	455	665
40-200	648	595	735	1155	385	420	525	770	350	438	385	683	315	368	455	665
40-250	648	595	735	1155	385	420	525	770	350	438	385	683	315	368	455	665
50-160	648	595	735	1155	385	420	525	770	472	578	525	910	350	403	490	718
50-200	648	595	735	1155	385	420	525	770	472	578	525	910	350	403	490	718
50-250	648	595	735	1155	385	420	525	770	472	578	525	910	350	403	490	718
65-160	788	718	875	1383	403	455	560	823	595	735	648	1155	385	420	525	770
65-200	788	718	875	1383	403	455	560	823	595	735	648	1155	385	420	525	770
65-250	788	718	875	1383	403	455	560	823	595	735	648	1155	385	420	525	770
65-315	788	718	875	1383	403	455	560	823	595	735	648	1155	385	420	525	770
80-160	1050	945	1173	1837	438	507	613	910	718	875	788	1383	403	455	560	823
80-200	1050	945	1173	1837	438	507	613	910	718	875	788	1383	403	455	560	823
80-250	1050	945	1173	1837	438	507	613	910	718	875	788	1383	403	455	560	823
80-315	1050	945	1173	1837	438	507	613	910	718	875	788	1383	403	455	560	823
80-400	1243	1120	1383	2170	525	665	735	1068	718	875	788	1383	403	455	560	823
100-125	1050	945	1173	1837	438	507	613	910	945	1173	1050	1837	438	507	613	910
100-160	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1837	438	507	613	910
100-200	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1837	438	507	613	910
100-250	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1837	438	507	613	910
100-315	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1837	438	507	613	910
100-400	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1837	438	507	613	910
125-250	1575	1418	1750	2748	613	718	875	1278	1120	1383	1243	2170	525	665	735	1068
125-315	1575	1418	1750	2748	613	718	875	1278	1120	1383	1243	2170	525	665	735	1068
125-400	1575	1418	1750	2748	613	718	875	1278	1120	1383	1243	2170	525	665	735	1068
150-315	2100	1890	2345	3657	805	927	1138	1680	1418	1750	1575	2748	613	718	875	1278
150-400	2100	1890	2345	3657	805	927	1138	1680	1418	1750	1575	2748	613	718	875	1278
200-200	2100	1890	2345	3657	805	927	1138	1680	1890	2345	2100	3657	805	927	1138	1680

The basic values mentioned in the table above are related to the pump casing materials cast iron and bronze.

10.5 Maximum allowable working pressures

Table 6: Maximum allowable working pressure [bar]

Materials	[bar]
100-160	6
200-200	
all other	10

Test pressure: 1,5 x max. working pressure.

10.6 Hydraulic performance

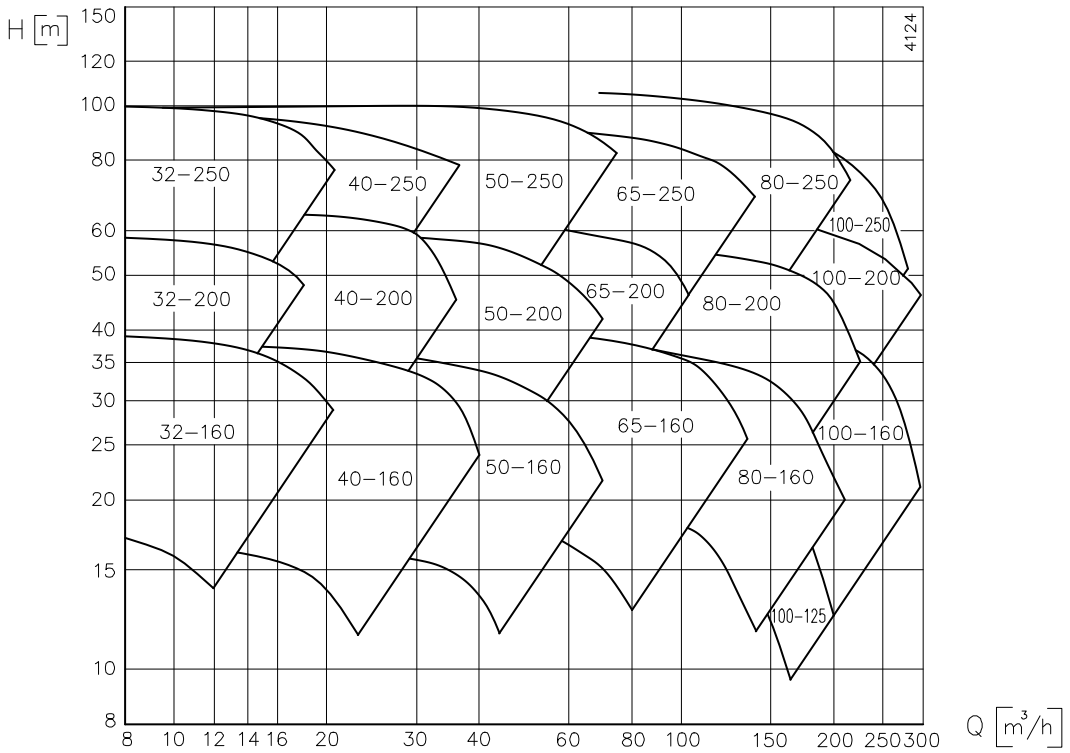


Figure 39: Performance overview 3000 min^{-1}.

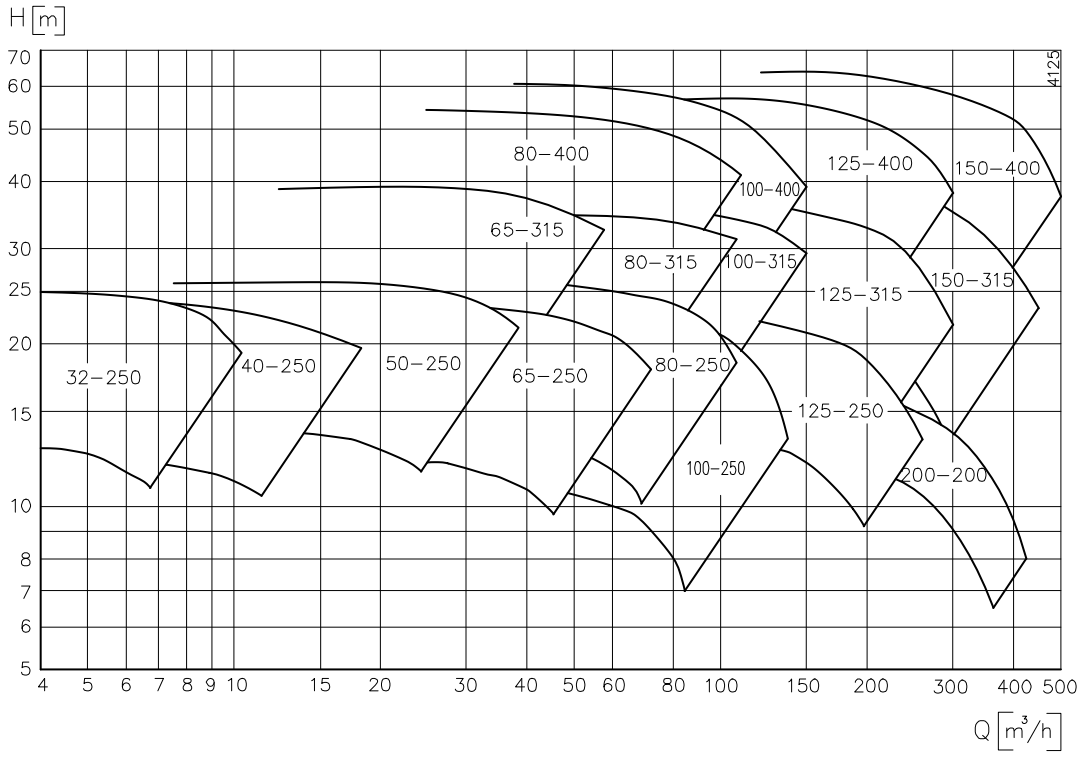


Figure 40: Performance overview 1500 min^{-1}.

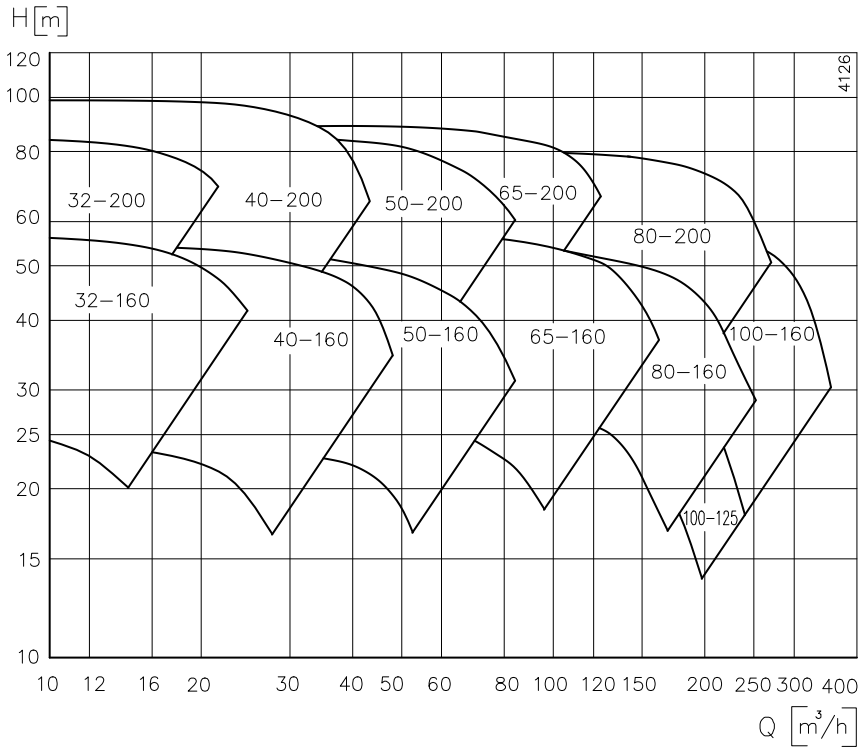


Figure 41: Performance overview 3600 min^{-1}.

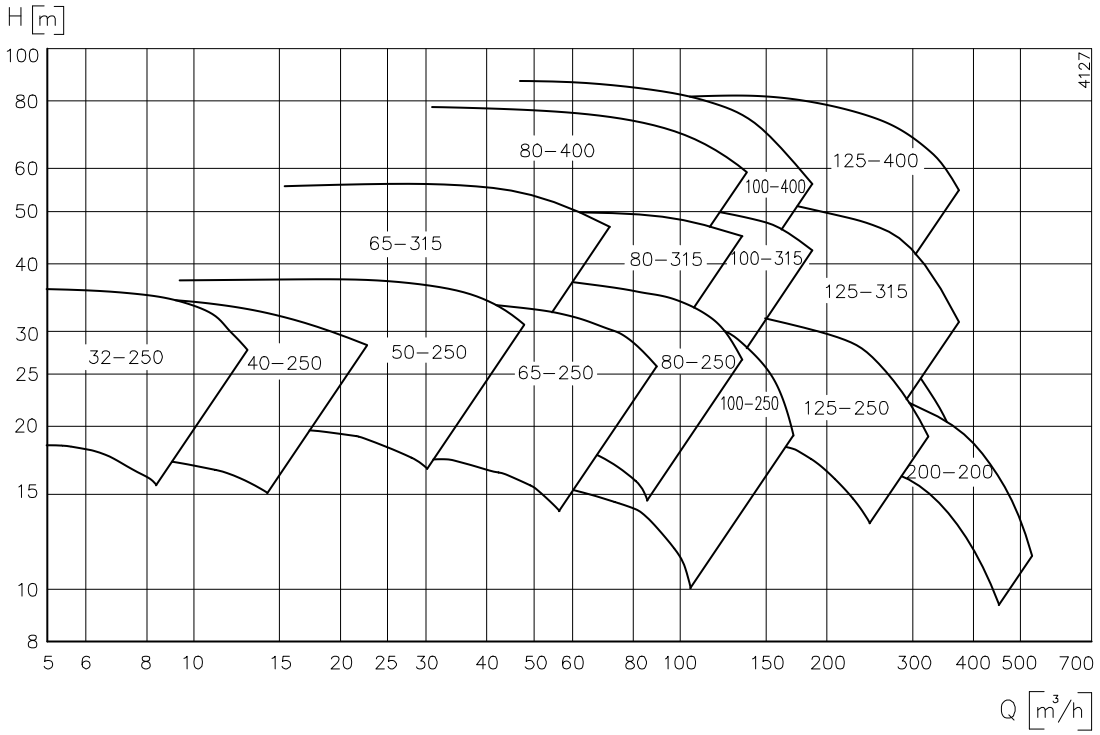


Figure 42: Performance overview 1800 min^{-1}.

10.7 Noise data

10.7.1 Pump noise as a function of pump power

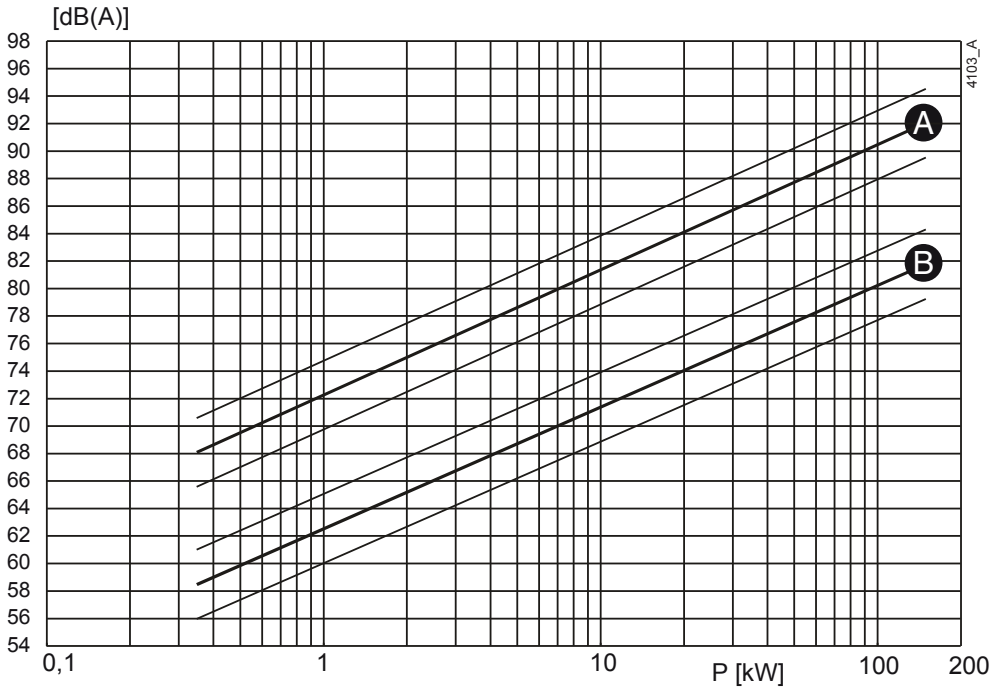


Figure 43: Noise level as function of pump power [kW] at 1450 min^{-1}
A = sound energy, B = sound pressure.

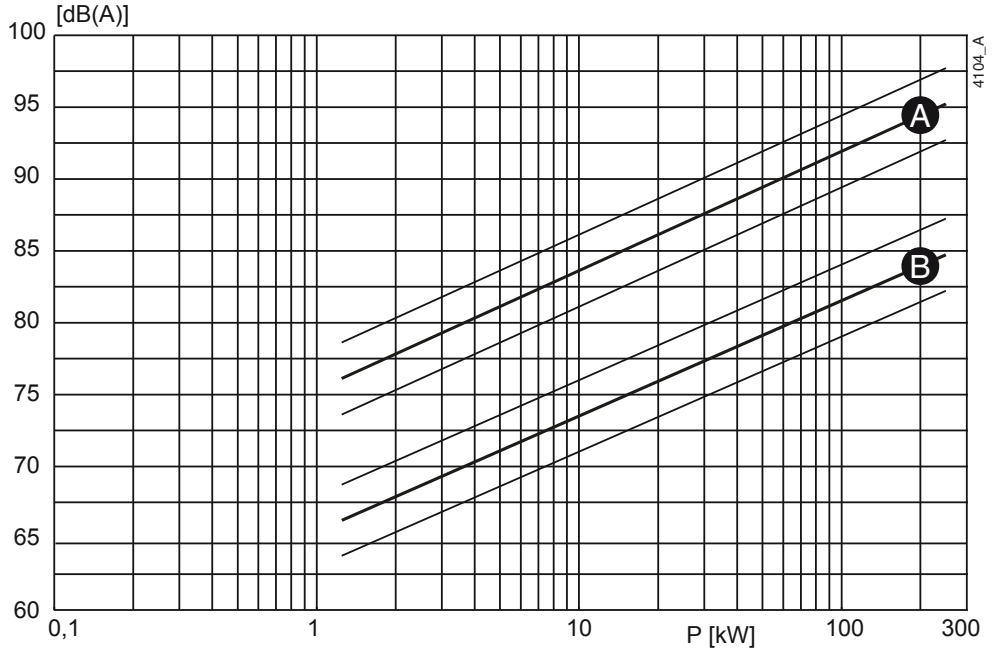


Figure 44: Noise level as function of pump power [kW] at 2900 min^{-1}
A = sound energy, B = sound pressure.

10.7.2 Noise level of entire pump unit

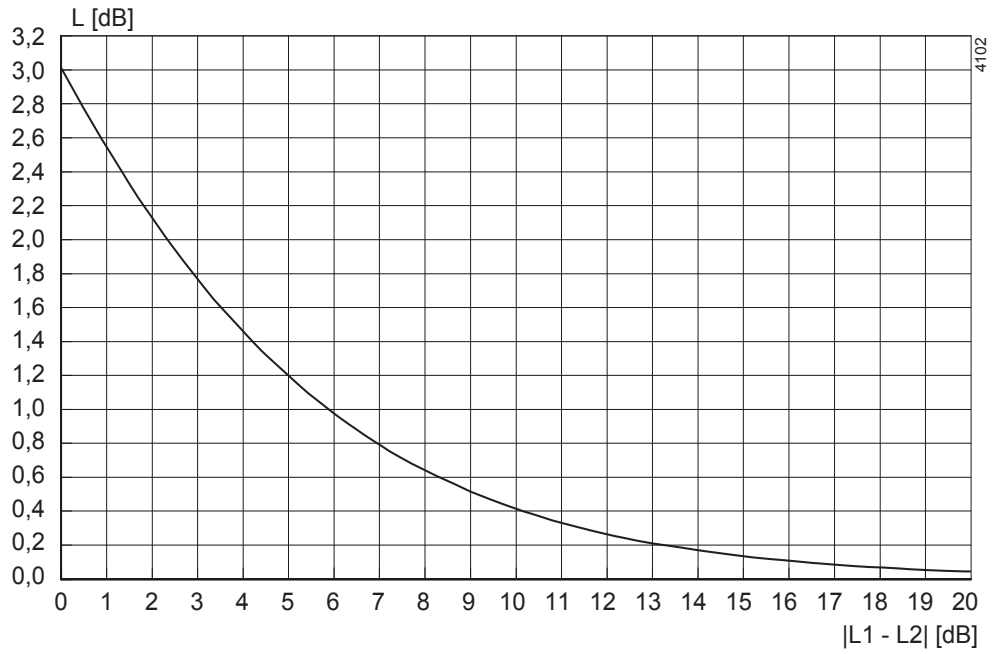


Figure 45: Noise level of entire pump unit.

In order to determine the total noise level of the entire pump unit, the noise level of the motor must be added to that of the pump. This can be easily done by using the graph above.

1 Determine the noise level (L1) of the pump, see figure 43 or figure 44.
2 Determine the noise level (L2) of the motor, see documentation of the motor.
3 Determine the difference between both levels |L1 - L2|.
4 Find the differential value on the |L1 - L2|-axis and go up to the curve.
5 From the curve go left to the L[dB] -axis and read out the value.
6 Add this value to the highest value of both noise levels (L1 or L2).

Example:

1 Pump 75 dB; motor 78 dB.
2 |75-78| = 3 dB.
3 3 dB on the X-axis = 1,75 dB on the Y-axis.
4 Highest noise level + 1,75 dB = 78 + 1,75 = 79,75 dB.

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Order form for spare parts

FAX Nr.	
ADDRESS	

Your order will only be dealt with if this order form has been correctly completed and signed.

Order date:	
Your order number:	
Pump type:	
Execution:	

Quantity	Item. No.	Part	Article number pump

Delivery address:	Invoicing address:

Ordered by:	Signature:	Telephone:

CombiPrime H

Horizontal self-priming centrifugal pump

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